BEFORE THE HEARINGS PANEL
FOR THE PROPOSED TE TAI O POUTINI PLAN

UNDER	the Resource Management Act 1991
IN THE MATTER	of a submission in a Plan Change under clause 6 of Schedule 1 of the Act
BETWEEN	**SKYLINE ENTERPRISES LIMITED**
	Submitter

STATEMENT OF EVIDENCE OF DR ANDREW WELLS

Dated: 9 September 2024

TODD & WALKER law
LAWYERS | NOTARY PUBLIC

Solicitor acting
G M Todd / R E M Hill
PO Box 124 Queenstown 9348
P: 03 441 2743
graeme@toddandwalker.com
rosie.hill@toddandwalker.com

Statement of evidence of Dr Andrew Wells

Introduction

[1] My name is Dr Andrew Peter Wells.

[2] I am a Senior Ecologist at Wildland Consultants Limited (**Wildlands**). I have worked in the field of ecology for 25 years, and specialise in terrestrial ecology.

[3] I hold the degrees of Bachelor of Forestry Science with First Class Honours (1995) from the University of Canterbury and Doctorate of Philosophy (2000) from Lincoln University, where my studies were undertaken in the Department of Plant Sciences. Subsequent to University study I was awarded a three-year Post-Doctoral Fellowship from the Foundation for Research, Science and Technology, during which time I was employed by GNS Science based in Wānaka and South Westland. Since then, I have worked for a number of Government Departments, Universities and private sector firms as a terrestrial ecologist undertaking ecological research, consultancy and teaching. I have been employed by Wildland Consultants Limited since 2022, based in Wānaka, and my current position is Senior Ecologist.

[4] I am an author of 24 scientific papers published in peer-reviewed international and national scientific journals. I have also presented aspects of my research at national and international scientific conferences. I have lectured in ecology and pedology on study abroad programmes of several North American Universities. I continue to publish research papers in collaboration with other scientists as time permits.

[5] I am very familiar with the ecology of the West Coast. I have undertaken field-based ecological research in Westland for over 25 years, with a particular specialty in vegetation and ecosystem development following natural and human-induced disturbance. This research has included extensive field work in virtually all major river catchments south of Ross other than the Landsborough Valley, from floodplains to valley heads. I was also employed by the Department of Conservation (**DOC**) from 2000

to 2005, as a Community Relations Ranger in Franz Josef Area Office and Conservancy Advisory Scientist in West Coast Conservancy Office.

[6] My work as an ecological consultant has covered a wide range of ecosystem types, including wetlands, grasslands, shrublands, forests, and alpine vegetation. This work has included ecological investigations in Buller, Westland, Canterbury, Otago, and Southland. I am an author of over 100 contract reports covering these assessments and I have prepared expert evidence for the Environment Court or similar cases in relation to some of these projects.

[7] My experience includes assessments of large-scale developments affecting indigenous vegetation and habitats such as roading and transportation developments, residential subdivisions, solar farms, quarries, and coal and gold mines. For the past two years I have also led a project that has conducted ecological surveys and reporting on more than 250 properties in the Southland region.

Code of conduct for expert witnesses

[8] I confirm I have read the Code of Conduct for expert witnesses contained in the Environment Court of New Zealand Practice Note 2023 and that I have complied with it when preparing my evidence. Other than when I state I am relying on the advice of another person, this evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

Scope of evidence

[9] I have been engaged by Skyline Enterprises Limited (**SEL**) to provide expert ecology evidence with respect to the Te Tai o Poutini Plan (**TTPP**), being the proposed combined District Plan for Westland, Buller, and Grey District Councils.

[10] This evidence is prepared in advance of the hearing planned to be heard by the Commissioners on 8-9 October 2024 at 97 Cron Street, Franz Josef.

[11] This statement of evidence is a summary of key points provided in a report previously prepared by Wildlands for SEL (hereafter referred to as

the **Wildlands report**). The Wildlands report was prepared by a range of specialist ecologists employed by Wildlands, of which I was the project manager and overall report author.

[12] The Wildlands report is provided as **Attachment 1** to this statement of evidence.

[13] The Wildlands report provides a high-level assessment of the ecological values present within the proposed Franz Josef Amenities Area Zone (**FJAAZ**), potential ecological effects of the proposed aerial cableway (**AC**), and options for managing these effects.

[14] The assessment is based on the preliminary design plans developed by SEL for the proposed AC that are indicative of the nature and scale of the anticipated development. These plans allow for general assessments of the feasibility of the proposal. However, these plans would be subject to additional significant design input at the future consenting stage, which would include incorporation of ecological matters in the finalised design.

[15] The key ecological features assessed in the Wildlands report are:

(a) Vegetation and habitat types, including rare ecosystems and wetlands (I undertook this assessment).

(b) Avifauna and bat values (assessment undertaken by Dr Della Bennet, Senior Avifauna Ecologist).

(c) Terrestrial invertebrate values (assessment undertaken by Dr Victoria Smith, Senior Invertebrate Ecologist).

(d) Lizard values (assessment undertaken by Samantha King, Senior Herpetologist).

(e) Freshwater values (assessment undertaken by Lucian Funnell, Freshwater Ecologist).

Ecological values

[16] The proposed FJAAZ has very high ecological values as an integral part of a protected intact altitudinal landform and vegetation sequence,

containing diverse ecosystems from lowland forest to alpine fellfield. In conjunction with the adjoining landscape, it provides habitat for a wide and diverse array of indigenous flora and fauna including several Threatened and At Risk species.

[17] Additional ecological surveys are required to better understand the presence, abundance and distribution of some species within the proposed FJAAZ and AC footprint, especially for lizards, bats, and invertebrates for which there is limited existing information.

Ecological effects

[18] The effects of the proposed AC on ecological values primarily relate to the loss of vegetation and habitat, the increased likelihood of exotic plant and animal invasion within intact habitats, the risk of bird strike from window reflection with the aerial cabins and possibly the cableway itself, and disruption of kea behaviour by visitors at Crawford Knob in particular.

[19] Without mitigation, some of these effects are likely to be more than minor, in particular those relating to the ongoing operation of the AC including disturbance to fauna and increased likelihood of exotic plant invasion.

[20] Further surveys of specific aspects of flora and fauna for which there is limited existing information would be required to confirm these effects and their extent.

[21] The concept plans and provisions presented by SEL (and outlined in the evidence of Mr Sean Dent) are sufficiently adaptable to allow for the accommodation of any additional ecological constraints that may emerge from these future surveys. This includes potential movements in locations of AC towers and infrastructure, and modifications to the design and operational features of the AC.

Ecological effects management

[22] Subject to the findings of the additional ecological surveys, the ecological effects of the proposal can be appropriately managed through

a combination of avoidance measures, fauna management plans, and offsetting and compensation plantings in lowland environments of the ecological district. With mitigation in place, it is considered that the ecological effects of the proposal will be able to be reduced to levels of minor or less than minor.

[23] Details of effects management and AC design would need to be developed at the time of a resource consent application, and following completion of the additional ecological surveys.

[24] The concept plans and provisions proposed by SEL for the FJAAZ are considered to provide adequate direction and scope for the ecological effects outlined in this report to be appropriately assessed and managed, through a discretionary consenting process. It is therefore considered that, subject to these further surveys and AC design refinements, it is feasible from an ecological perspective to apply the proposed FJAAZ and implement a future AC with effects likely being minor or less.

Conclusion

[25] The proposed FJAAZ is an intact ecosystem with very high ecological values. These values are associated with individual flora and fauna species, as well as landscape-level aspects including connectivity and intact sequences. Further ecological surveys are required to better understand ecological values related to invertebrates, lizards, and bats within the FJAAZ.

[26] Subject to the further ecological surveys, it is considered that adverse ecological effects associated with the construction and ongoing operation of the proposed AC can be appropriately managed through the effects management hierarchy, such that ecological effects of the proposal will be reduced to levels of minor or less than minor.

[27] The proposed FJAAZ and associated concept plans and provisions also provide adequate scope for additional significant design input at the future consenting stage, which would include incorporation of ecological matters in the finalised design including any additional matters emerging through future surveys. Therefore, ecological considerations should not prevent the rezoning of this site.

Dated: 9 September 2024

Dr Andrew Wells

Attachment 1 - Wildlands Report

Ecological Assessment of a Proposed Aerial Cableway, Franz Josef

Contract Report No. 7255

Providing outstanding ecological services to sustain and improve our environments

Wildlands

Ecological Assessment of a Proposed Aerial Cableway, Franz Josef

Contract Report No. 7255

August 2024

Project Team:

Andrew Wells - Report author (vegetation)

Anna Meban – Report author (herpetofauna)

Della Bennet – Report author (avifauna)

Kelvin Lloyd – Peer review

Lucian Funnell – Report author (freshwater)

Rachel Crawford – Report author (bats and avifauna)

Samantha King - Report author (herpetofauna)

Vikki Smith - Report author (invertebrates)

Prepared for:

Skyline Enterprises Limited

PO Box 17

Queenstown 9348

Reviewed and approved for release by:

Kelvin Lloyd

30/08/2024
Kelvin Lloyd
Senior Principal Ecologist
Wildland Consultants Ltd

Cite this report as follows:

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Christchurch Office
238 Annex Road, Middleton, PO Box 9276, Tower Junction, Ph 03 338-4005

Head Office
99 Sala Street, PO Box 7137, Te Ngae, Rotorua Ph 07-343-9017 Fax 07-343-9018 Email: rotorua@wildlands.co.nz

www.wildlands.co.nz

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1.0 Introduction

Skyline Enterprises Limited (SEL) have expressed an interest in building and operating an aerial cableway within Westland Tai Poutini National Park for the purpose of providing visitor access to Franz Josef Glacier. The retreat of the glacier has resulted in management issues including a restricted ability to access the glacier via the existing infrastructure.

The Westland Tai Poutini National Park Management Plan Review process that commenced several years ago provided an opportunity for SEL to seek the incorporation of an Amenities Area to a part of the Franz Josef Glacier Valley. The purpose of this Amenities Area is to provide for the consideration of an aerial cableway in a future Concession application. This review process is ongoing.

Subsequent to this, the Grey, Buller, and Westland Districts notified a combined District Plan - Te Tai O Poutini Plan (TTPP) in 2022. SEL has lodged a similar submission on the combined district plan seeking the inclusion of a new Special Purposes Zone referred to as the Franz Josef Amenities Area Zone (FJAAZ or AA) into the TTPP. The purpose of the AA is to identify and set aside an area that can appropriately facilitate the development of an aerial cableway (AC) through a future Discretionary Activity consent process and supported by associated objective and policy framework. Consequential amendments are also proposed to other chapters of the TTPP to facilitate future development within the proposed AA. These proposed amendments are detailed in the evidence of Mr Sean Dent.

At this early stage of the process, SEL has developed preliminary design plans for the proposed AC that are indicative of the nature and scale of the anticipated development. These plans allow for general assessments of the feasibility of the proposal. However, it is important to note that these plans would be subject to additional significant design input at the future consenting stage, which would include incorporation of ecological matters in the finalised design.

SEL commissioned Wildland Consultants Limited to undertake an assessment of the ecological values of the proposed AA and the potential effects of a future AC on indigenous biodiversity. This report presents the findings of the ecological assessment.

2.0 The Amenities Area and Aerial Cableway Description

The proposed AA is an area of 430 hectares and comprises a rectangular corridor between 5,910 and 6,670 metres long and between 450 and 1,030 metres wide, extending from, and including, the Franz Josef car park up to Crawford Knob along the true right side of the Waiho River valley (Figure 1, and Photos 1 and 2). This area encompasses the proposed AC buildings, infrastructure, and car parking area. The AA includes a cross-section of the glacial Waiho valley from the gentle valley floor, across vegetated valley slopes to Crawford Knob, situated below the steep peaks above the Almer Glacier and Salisbury Snowfield, including the Baird Range and Saint Mildred Peak at 2,895 metres above sea level (masl).

The following details have been adapted from the Landscape Assessment of Rough and Milne (2019), the plans of the preliminary AC profile provided by SEL, and the provisions proposed by SEL for the AA as presented in the evidence of Mr Sean Dent. As mentioned above, it is important to note that these are preliminary conceptual and indicative design plans for the AC, and as such would be subject to significant further design assessment at the time of a consent application. This includes the AC alignment, number and location of towers, and building sizes and locations.

The AC alignment

The proposed AC will be located within the AA and extend over approximately 5.7 kilometres, beginning in the lower valley near the existing car park (*c*.226 masl) and traversing the true right/ eastern slopes of the Waiho River valley, ascending to Crawford Knob (*c*.1,665 masl). From the car park, the AC will cross the Waiho River and ascend steeply up the eastern slopes of the Baird Range, crossing several small mountain creeks (most notably Rope Creek) before crossing over Coulter Ridge and Hende Ridge and sidling across the neck of the Carrel Glacier basin to Crawford Knob.

The AC structures

Full design details of the proposed AC have not yet been developed, as SEL is still undertaking investigations, and these would ultimately be designed on the basis of significant further evidence and assessment from a number of experts, including ecological input. However, the following description provides an overview of general alignment based on preliminary plans. The number and location of associated buildings/components that could eventuate will depend on the more detailed investigation and design.

A base station is likely to be located on or close to the visitor's car park at the road end in the Waiho Valley, and may include visitor facilities, open-air boarding and viewing platforms. The uppermost structure/s will be located in the vicinity of Crawford Knob. A mid-station at Coulter Ridge is also likely. The intention at the top and mid stations is to have enclosed buildings and open-air viewing platforms/decks for visitors, but with no general visitor access permitted beyond these defined spaces. Some managed access beyond these spaces may be provided for competent private alpine recreationists and concessionaires, where safe to do so. The details of built structures are not finalised at this time and will be determined by the operational requirements and environmental constraints.

Eight AC support structures (towers) 24 metres in height are conceptually proposed, their locations are marked in Figure 1. The number, size/capacity and travel speed of any cabins have not yet been determined.

3.0 Project Scope and Summary of Findings

3.1 Project scope

This report provides a high-level assessment of the ecological values present within the AA, and is based on the current proposed boundaries of the AA and AC location and design.

The key ecological features assessed are:

- Vegetation and habitat types present, including rare ecosystems and wetlands.
- Flora values.
- Avifauna values.
- Bat values.
- Terrestrial invertebrate values.
- Lizard values.
- Freshwater values.

Potential effects of the proposed AC development on the ecosystems and species present are described, and options for managing these potential effects are then discussed.

A brief overview of the findings of this report is provided in Section 3.2 below.

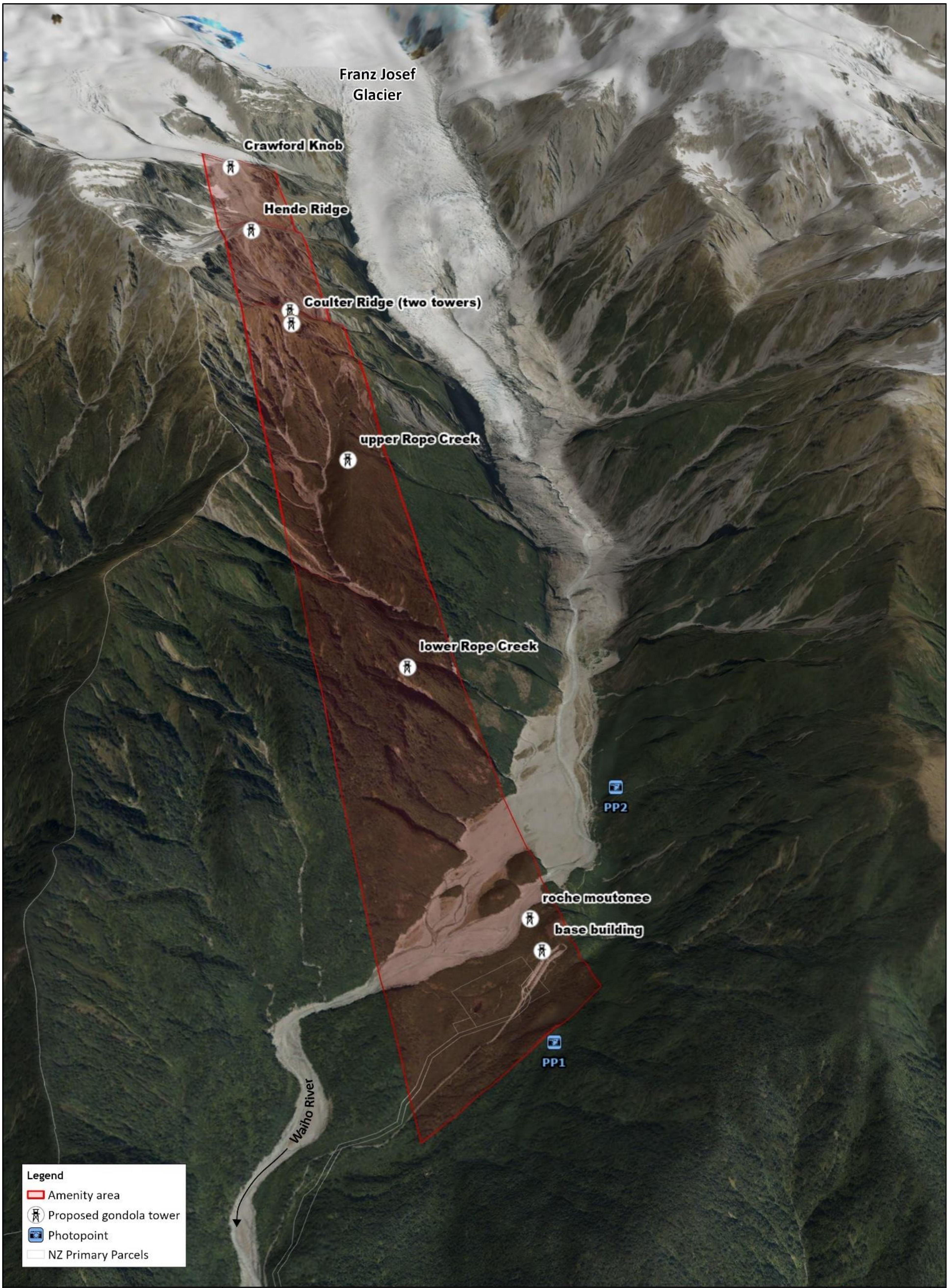

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Figure 1. Location of the proposed amenity area within Westland National Park, and the sites of the proposed aerial cableway towers.

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Scale:
Date: 16/07/2024
Cartographer: BL
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Photo 1. View of the Waiho River valley, with the existing carpark in the foreground. Proposed locations of the lower six cableway towers are marked (from bottom) - base building, roche moutonee, lower Rope Creek, upper Rope Creek, and Coulter Ridge mid station (two towers)

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Photo 2. View of the upper Waiho River valley, showing proposed tower locations (from left) at lower Rope Creek, upper Rope Creek, Coulter Ridge (two towers), Hende Ridge, and Crawford Knob

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Cartographer: BL
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3.2 Summary of findings

The proposed AA has very high ecological values as an integral part of a protected intact altitudinal landform and vegetation sequence, containing diverse ecosystems from lowland forest to alpine fellfield. In conjunction with the adjoining landscape, it provides habitat for a wide and diverse array of indigenous flora and fauna including several Threatened and At Risk species. Additional ecological surveys are required to better understand the presence, abundance and distribution of some species, especially for lizards, bats and invertebrates for which there is limited existing information.

The effects of the proposed AC on ecological values primarily relate to the loss of vegetation and habitat, the increased likelihood of exotic plant and animal invasion within intact habitats, the risk of bird strike from window reflection with the aerial cabins and possibly the cableway itself, and disruption of kea behaviour by visitors at Crawford Knob in particular.

Subject to the findings of the additional ecological surveys, it is considered that the ecological effects of the proposal can be appropriately managed through a combination of avoidance measures, fauna management plans, and offsetting and compensation plantings in lowland environments of the ecological district. Details of effects management and AC design would need to be developed at the time of a resource consent application, and following completion of the additional ecological surveys. The draft provisions proposed by SEL for the AA are considered to provide adequate direction and scope for the ecological effects outlined in this report to be appropriately assessed and managed, through a discretionary consenting process. Wildlands therefore considers that, subject to these further surveys and AC design refinements, it is feasible from an ecological perspective to apply the proposed AA and implement a future AC with effects likely being minor or less.

4.0 Ecological Context

4.1 Site overview

The AA lies within the Waiho River Valley, approximately four kilometres from the Franz Josef township and south of the State Highway 6 bridge. This valley extends approximately 14 kilometres to the upper snowfields of the Southern Alps above the Franz Josef Glacier. The north-south trending valley is a typical U-shaped glacial valley with a flat valley floor and sheer rock walls on either side. The southern end of the valley is dominated by the terminal face of the Franz Josef Glacier, the glacier itself and the steep ridgeline and peaks of the Southern Alps.

The Waiho Valley contains a wide range of ecosystems, mostly in an intact natural condition. The vegetation sequence is of particular ecological note, and reflects both altitudinal and glacial influences. The sequence encompasses seral broadleaved and mixed podocarp forest on lower river flats and moraines, seral vegetation on scoured bedrock on lower slopes, mature broadleaved forests on steep colluvial fans and rock faces, dense subalpine scrub, subalpine tussocklands, low growing alpine vegetation, and extensive boulderfields and scree slopes. Snowfields are permanent in some areas and extend over the upper slopes seasonally.

The distinctive natural values of the Waiho Valley – the geological, topographical, ecological, and dynamic components of the landscape – make it an integral part of Westland Tai Poutini National Park, and of the Te Wāhipounamu-South West New Zealand World Heritage Area. As well as this, the valley's natural history has made it one of the premier locations internationally for scientific studies of glaciation, and soil and vegetation chronosequences.

4.2 Ecological District

The site is within the Glaciers Ecological District. The following description is adapted from McEwen (1987). The district lies east of the Alpine fault, with geology comprising Haast schist, and includes most of the highest peaks of New Zealand and the country's largest west-flowing glaciers. The westernmost portion of the district also includes well-developed lowland chronosequences down valley from retreating glaciers, most notably within the Franz Josef Glacier and Fox Glacier valleys. Precipitation is very high at 4,800 to 8,000 millimetres per year, with a mountain climate over most of the district. Soils are primarily stony alpine soils with large areas of bare rock and scree at higher altitudes, but small areas of soils are present on moraines within lower valleys.

The district lies within the 'Westland beech gap', an area notable for the absence of beech tree species. Areas below the snowline contain a sequence of vegetation belts characteristic of high rainfall areas where beech is lacking: mixed podocarp-broadleaved forest on lower slopes, southern rātā (*Metrosideros umbellata*)-kāmahi (*Pterophylla racemosa*) forest at higher altitudes, subalpine scrub, snow tussock grasslands, herbfields and high-alpine vegetation. The low altitude, glacially related vegetation and soil chronosequences in Franz Josef and Fox valleys are a special feature that are the subject of long-standing international scientific attention.

A wide range of indigenous avifauna is present in the district, including birds of forest, subalpine and alpine habitats. Invertebrates include the grass moth *Orocrambus clarkei* Philpott at Mount Moltke, just west of the AA, and the beetle *Paratrochus foveatus*. The large alpine grasshopper (e.g. *Brachapsis* sp.) appears to be absent (McEwen 1987).

5.0 Methods

5.1 Desktop assessment

Relevant ecological literature and databases for the wider area were reviewed, including aerial imagery, topographic mapping, scientific reports and journal articles, and flora and fauna recordings. Broad vegetation and habitat zones were mapped on aerial imagery, for verification and refinement in the field.

A desktop assessment was undertaken for avifauna, bats, invertebrates, lizards and freshwater fish.

A desktop assessment of avifauna within a 10-kilometre radius of the proposed Franz Josef Cableway was conducted by searching the online database eBird between January 2000 and March 2024.

Department of Conservation (DOC) Bat Distribution Database (May 2024 version) was accessed on 29 July 2024, to determine bat records within a 19-kilometre radius of the proposed amenity area.

The terrestrial invertebrate desktop survey involved searching the Global Biodiversity Information Facility (GBIF.org 2024[1]) for species records within five kilometres of the proposed AA perimeter. The Scientific Name filter was also applied, using the terms Arachnida, Athoracophoridae, Rhytididae, Insecta, and Onychophora to represent spiders, leaf-veined slugs, indigenous giant land snails, insects, and velvet worms respectively.

DOC BioWeb herpetofauna database was accessed August 2023 to determine lizard records within the Westland/south Westland district. Only species on the western side of the main divide were

[1] GBIF.org (12 August 2024) GBIF Occurrence Download https://doi.org/10.15468/dl.4c3ghr

considered during this assessment due to the Southern Alps acting as a significant barrier to eastern species.

From the records retrieved by the GBIF search, freshwater invertebrates were removed. Observations that were not identified further than order, or were marked as doubtful, were deleted. This dataset was used to characterise the fauna based on the most commonly-represented orders. Of the remaining records, those identified to a useful level (usually genus or species) were scanned for notable species[2]. These were compared with vegetation and habitat on-site to judge the likelihood of each notable species occurring within the project area.

Invertebrates are under-represented in the Wildlife Act (1953) and in species threat lists, with less than 10% of arthropod species having had their threat status assessed under the New Zealand Threat Classification System. Therefore, to fully represent the importance and significance of invertebrate fauna on-site, species notability and biodiversity were assessed in addition to threat and protection status.

For freshwater fish, the New Zealand Freshwater Fish Database (Stoffels 2022) was reviewed for records within the Waiho River catchment.

5.2 Site visit

A one-day site visit was undertaken on 19 July 2024 by one ecologist. During this site visit, a walk-through survey was undertaken over the portion of the AA between the Franz Josef carpark and the lower Rope Creek tower location. Vascular plant species observed were recorded and are listed in Appendix 2. Bird species observed at the site were also recorded. Vegetation and habitat types were mapped and described following the structural classes in Atkinson (1985).

Areas above the lower Rope Creek tower (see Figure 1) were not easily accessible on foot, and an aerial survey of this area of the AA was undertaken from a helicopter. Hovering over representative areas of key vegetation and habitat types allowed aerial survey of habitat types and identification of key plant species.

Unfortunately, the upper rocky basins of the AA between Hende Ridge and Crawford Knob was covered in snow, limiting field observations within this section. Vegetation and habitats within this area were therefore inferred from aerial imagery, published descriptions of similar habitats in Westland Tai Poutini National Park (e.g. Wardle 1977), and local knowledge of Wildlands staff from recreational trips across this section of the AA.

5.3 Ecological significance assessment

The ecological values of the site were assessed, and their ecological significance was assessed using the criteria outlined in the National Policy Statement for Indigenous Biodiversity (NPS-IB), and the criteria outlined in Section 4.9D of the Westland District Plan (Westland District Council 2002).

5.4 Assessment of ecological effects of the AC

Potential effects of the proposal on ecological values (vegetation, avifauna, bats, invertebrates, lizards and freshwater) were assessed separately. The potential effects of the project were also assessed against relevant indigenous vegetation clearance rules in the Westland District Plan and provisions of

[2] Notable species are locally endemic, known or suspected to be declining, particularly sensitive to habitat loss or predation by introduced mammals, or listed as Threatened or At Risk.

the NPS-IB. Potential measures for avoiding, minimising, and/or remediating adverse effects of the proposal on ecological values were identified and evaluated, along with suggested management actions.

6.0 Vegetation and Habitats

6.1 Overview

Twelve vegetation and habitat types are present in the AA (Table 1). These are mapped in Figure 2, and described below. Representative photographs are contained in Appendix 1. Most of the plant communities have changed little since European settlement.

Table 1 – Vegetation and habitat types at the proposed Franz Josef amenity area.

Vegetation Type
1. (Podocarp-southern rātā)/kāmahi forest
2. Upland southern rātā-kāmahi forest
3. Seral low broadleaved species forest
4. Seral vegetation on roche moutonnée
5. Seral vegetation on glacially scoured schist
6. *Dracophyllum-Olearia* forest and scrub
7. *Dracophyllum-Chionochloa* scrub/grassland mosaic
8. High altitude short grassland and herbfield
9. Boulderfield with short herbaceous vegetation
10. Waiho River bed
11. Kettle lake – Peter's Pool
12. Rivers and streams (not mapped in Figure 2)

6.2 Vegetation and habitat type descriptions

1. (Podocarp-southern rātā)/kāmahi forest

Small areas of moraine at the south of the AA contain a mature forest canopy of predominantly kāmahi, with scattered emergent miro (*Pectinopitys ferruginea*), rimu (*Dacrydium cupressinum*) and Hall's tōtara (*Podocarpus laetus*) and occasional southern rātā. The lower tiers contain a diverse mix of broadleaved species and ferns. This forest has developed from successional southern rātā-kāmahi forest on glacial landforms formed between c.1600-1750 AD (Wardle 1977).

2. Upland southern rātā-kāmahi forest

Mature forest dominated by large southern rātā and kāmahi trees to c.90 centimetres in diameter and 20 metres tall is present on the valley-side colluvium and exposed spurs to an altitude of c.700 metres. The subcanopy and shrub layers comprise kātote/Smith's tree fern (*Cyathea smithii*), wheki/rough tree fern (*Dicksonia squarrosa*), *Pseudopanax simplex*, horopito/ peppertree (*Pseudowintera colorata*), māpou (*Myrsine australis*), narrow-leaved māhoe

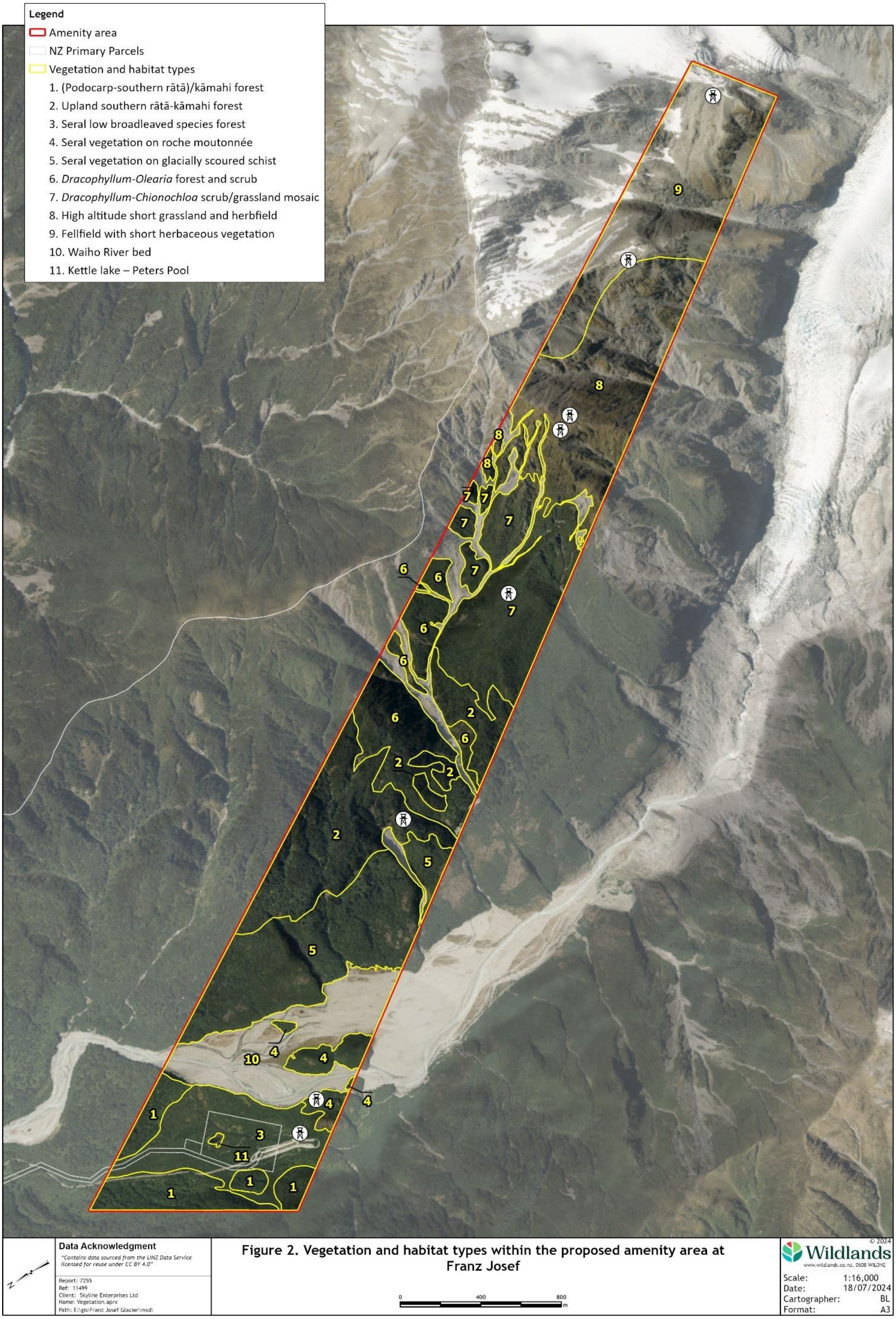

Figure 2. Vegetation and habitat types within the proposed amenity area at Franz Josef

(*Melicytus lanceolatus*), small-leaved coprosmas, piripiriwhata/marbleleaf (*Carpodetus serratus*), patē/seven finger (*Schefflera digitata*), karamū (*Coprosma lucida*), horoeka/lancewood (*Pseudopanax crassifolius*), occasional miro, and vines of supplejack (*Ripogonum scandens*), bush lawyer (*Rubus cissoides*), and rātā (white rātā [*Metrosideros diffusa*] and climbing rātā [*M. fulgens*]). Leaf litter is abundant as ground cover, with kakaha/bush lily (*Astelia fragrans*), piupiu/crown fern (*Blechnum discolor*) and kiwakiwa (*B. fluviatile*) common. The canopy on exposed spurs is much lower (c.10 metres) and tight and wind-smoothed, with trees between 20-45 centimetres in diameter, and a very sparse understorey is present comprising hūpiro/stinkwood (*Coprosma foetidissima*), Smith's tree fern and horopito to one metre tall.

3. Seral low broadleaved species forest

Young successional broadleaved species forest is present on glacial outwash surfaces and small gravel fans formed by side creeks, between the current Waiho River bed and steep slopes to the west. Historical records show that the glacier retreated from this area in about 1865 AD. The 8-10-metre-high canopy contains a diverse range of species including *Olearia aviceniifolia*, mountain holly (*O. ilicifolia*), *Coprosma* spp., tree tutu (*Coriaria arborea*), kōhūhū (*Pittosporum tenuifolium*), marbleleaf, Smith's tree fern, wheki, kāpuka/broadleaf (*Griselinia littoralis*), narrow-leaved māhoe, patē, koromiko (*Veronica salicifolia*), *Pseudopanax simplex*, porokaiwhiri/pigeonwood (*Hedycarya arborea)* and mountain lacebark (*Hoheria glabrata*). A few kāmahi are also present. Largest trees are between 15-30 centimetres in diameter. The shrub layer comprises individuals of canopy species, as well as karamū, stinkwood and horopito. Ground cover is dominated by ferns (most prominently pūniu/prickly shield fern [*Polystichum vestitum*], small tree ferns, kōwaowao/hound's tongue [*Microsorum pustulatum*]) and bush lily, with occasional cutty grass (*Carex uncinata*) and areas of leaf litter. A small stream traverses the forest near the southern end of the carpark, with areas of dense young regeneration on recent gravels. The existing carpark and the proposed AC base building are within this vegetation type.

4. Seral vegetation on roches moutonnées

Several roches moutonnées formed in schist bedrock are present in the southeastern corner of the AA. Historical records indicate that these emerged from the retreating glacier in 1865 AD. The lower sections contain a forest canopy of southern rātā and kāmahi, up to about 55 centimetres in diameter, above a lower tier of kāpuka, stinkwood and small-leaved coprosmas, and ground cover of hound's tongue and kiokio (*Blechnum novae-zelandiae*). The middle and upper portions of the roches moutonnées contain smooth bedrock with frequent cover of bryophytes and lichens. Small depressions and crevices in the rock where soil material has accumulated contain a few shrubs of *Olearia aviceniifolia*, mountain holly, kāpuka, *Coprosma rugosa* and harakeke/lowland flax (*Phormium tenax*), and seedlings of southern rātā and kāmahi. A few plants of drooping poa (*Poa novae-zelandiae*) are also present. Kāpuka on the roches moutonnées has been heavily browsed. A proposed tower location is on one of the roches moutonnées.

5. Seral vegetation on glacially scoured schist

An area of glacially-scoured schist bedrock is present on the valley wall immediately above the eastern side of the Waiho River bed. This hillside appears to have been bared during the 17th century glacial advance, and exhibits various stages of succession. Vascular plant cover has increased very slowly, and the present cover includes a mosaic of bare bedrock and bryophytes (*Racomitrium* spp. mainly), open shrubland, and open low forest. Common species within areas of bare rock and shrubland include drooping poa, willowherb (*Epilobium glabellum*), rockfern (*Cheilanthes distans*), creeping clubmoss (*Lycopodium scariosum*), tree tutu, kiokio, bush lily, *Olearia aviceniifolia*, wharariki/mountain flax (*Phormium cookianum*), and toetoe (*Austroderia richardii*). Low forest comprises a canopy approximately four metres tall of mainly southern rātā and kāmahi, with some Hall's tōtara, weeping māpou (*Myrsine divaricata*), Smith's tree fern, *Coprosma rotundifolia*, pigeonwood and mountain neinei (*Dracophyllum traversii*). This area is also notable for the presence of occasional young rimu and miro trees, and clusters of lancewood.

6. *Dracophyllum-Olearia* forest and scrub

Dense scrub and low forest between c.850-1,100 metres elevation is dominated by mountain neinei, inaka (*Dracophyllum longifolium*), lancewood tree daisy (*Olearia lacunosa*) and mountain holly, with less abundant mountain lacebark, māpou, mountain fivefinger (*Pseudopanax colensoi*), *Coprosma pseudocuneata* and weeping māpou. Other species likely to be present include kāpuka, *Coprosma depressa* and *C. serrulata*. Canopy height is likely to be approximately five metres. Ground cover is likely to comprise mountain astelia (*Astelia nervosa*), prickly shield fern, kiokio, and mountain flax.

7. *Dracophyllum-Chionochloa* scrub/grassland mosaic

Steep hillsides between c.1,000 and 1,300 metres elevation contain a mosaic of low shrubs of mainly *Dracophyllum rosmarinifolium* and lancewood tree daisy, and tall tussocks of mainly narrow-leaved snow tussock (*Chionochloa rigida*). Other species present at lower abundances include mountain flax, *Coprosma cheesemanii*, *C. serrulata*, creeping māpou (*Myrsine nummularia*), Haast's carrot (*Anisotome haastii*), Fiordland mountain daisy (*Celmisia coriacea*), Armstrong's mountain daisy (*C. armstrongii*), Haast's mountain daisy (*Celmisia haastii*), mountain astelia, and spaniards (*Aciphylla crenulata; A. horrida*).

8. High altitude short grassland and herbfield

Bands of vegetation and bare eroding ground are present below c.1,500 metres. Species in the vegetated areas include mountain snow tussock (*Chionochloa oreophila*), mid-ribbed snow tussock (*C. pallens*), blue tussock (*Poa colensoi*), *Anisotome flexuosa*, Haast's mountain daisy, spaniards, *Licopodium fastiguatum*, *Raoulia grandiflora*, *Euphraisia* spp., *Microlaena colensoi*, mountain sedge (*Carex pyrenaica*), *Luzula crinita*, and *Agrostis magellanica*.

9. Boulderfield with short herbaceous vegetation

At the time of the site visit, this portion of the proposed AA was under snow. The following description is based off aerial imagery, observations of similar habitats by Wardle (1977), and recollections from a recreational trip over the area by a Wildlands staff member. Bare rocks and stones occupy most of the area, including some large rocks, with vascular plant cover of c.5-20% and sometimes a cover of bryophytes and lichens. Common species are likely to include mountain shield fern (*Polystichum cystostegia*), *Ranunculus buchananii*, *Celmisia* spp., *Euphrasia* spp., mountain danthonia (*Rytidosperma setifolium*), mountain snow tussock, and dwarf alpine woodrush (*Luzula colensoi*). Cushion-forming plants are also likely, including *Colobanthus monticola*, *Hectorella caespitosa*, *Veronica ciliolata*, and *Raoulia* spp. Snow hollows in depressions are likely to include *Raoulia subulata*, mountain sedge, and silky alpine buttercup (*Ranunculus sericophyllus*), with possible *Colobanthus canaliculatus*, *Kelleria lyallii*, mountain foxglove (*Ourisia sessilifolia*, and *Agrostis magellanica*.

10. Waiho River bed

The active bed of the Waiho River comprises very young aggradational river gravels and stones prone to regular flooding, with few vascular plants present. Patches of exotic grasses and indigenous shrubs of tree tutu are occasionally present.

11. Kettle lake – Peter's Pool

A small kettle lake formed in moraine deposited in 1865AD is present near the carpark. The margins of the lake contain a dense cover of *Carex gaudichaudiana*, with low shrubland further from the water's edge.

12. Rivers and streams

The Waiho River passes through the AA. Several other small creeks traverse the AA, the largest being Rope Creek on the eastern side of the valley. Rivers and streams are not mapped in Figure 2.

7.0 Flora

7.1 Overview

One hundred and forty nine indigenous vascular plant species were observed at the site, listed in Appendix 2a. Just 11 exotic plant species were observed (Appendix 2b).

7.2 Threatened, At Risk and notable species

Three Threatened plant species were observed within the AA – all *Metrosideros* spp. (Table 2). These species are widespread in forests below about 800 metres elevation. *Metrosideros* spp. are members of the Myrtaceae family of plants. Like other members of the Myrtaceae, their threat status was elevated as a precautionary measure at that time due to the threat posed by the imminent invasion of myrtle rust (*Austropuccinia psidii*). To date, some *Metrosideros* spp. have been more affected than others. Pōhutukawa (*Metrosideros excelsa*) has proved the most susceptible, while in many species the susceptibility is unknown. To date, myrtle rust has not been detected in the lower South Island. All three *Metrosideros* spp. found in the AA are extensively present in forests of the Waiho Valley, and throughout the forests of South Westland.

Table 2 – At Risk and Threatened plant species observed or possibly present in the proposed AA. Threat rankings follow de Lange *et al.* (2018).

Species	Common Name	Threat Status	Comment
Observed:			
Metrosideros diffusa	White rātā	Threatened – Nationally Vulnerable	In forests to c.800 metres elevation
Metrosideros fulgens	Climbing rātā	Threatened – Nationally Vulnerable	In forests to c.800 metres elevation
Metrosideros umbellata	Southern rātā	Threatened – Nationally Vulnerable	In forests to c.800 metres elevation

Species	Common Name	Threat Status	Comment
Possibly Present:			
Anisotome pilifera		At Risk-Declining	May be present in subalpine vegetation
Carex carsei	Carse's sedge	At Risk-Declining	May be present in subalpine vegetation
Chionochloa vireta	Snow tussock	At Risk-Naturally Uncommon	May be present in tussock grasslands
Dracophyllum fiordense		At Risk-Declining	May be present in subalpine scrub
Kelleria lyallii		At Risk-Naturally Uncommon	May be present in boulderfield habitat
Neomyrtus pedunculata	Rōhutu	Threatened-Nationally Critical	May be present in hillside forest
Ranunculus buchananii		At Risk-Declining	May be present in boulderfield habitat
Ranunculus godleyanus	Yellow alpine buttercup	At Risk-Recovering	May be present in subalpine vegetation
Rytidosperma buchananii		At Risk-Declining	May be present in subalpine vegetation

A further nine At Risk or Threatened plant species may be present, based on their known occurrence in similar habitats in Westland, but were not observed during the site visit. These species are generally only found at higher elevations, above forest and scrub vegetation.

7.3 Ecological weeds

Eleven exotic species were observed during the site visit, all of which were herbs or grasses (Appendix 2b). No woody exotic species were observed. The exotic species were observed along roads and tracks, and on fresh alluvium beside the small stream near the Franz Josef carpark. No exotic species were observed within the forest interior.

8.0 Fauna

8.1 Avifauna

The eBird desktop assessment identified 55 bird species within a 10-kilometre radius of the AA, including 43 indigenous and 12 exotic bird species (Table 3).

Seven indigenous species are classified as Threatened, including Nationally Critical: kotuku/white heron (*Ardea alba modesta*), Nationally Endangered kea (*Nestor notabilis*) and pīwauwau/southern rock wren (*Xenicus gilviventris rineyi*), Nationally Vulnerable pārera/grey duck (*Anas superciliosa*), kākā/South Island kaka (*Nestor meridionalis meridionalis*), koekoeā/long-tailed cuckoo (*Eudynamys taitensis*), and Nationally Increasing karearea/bush falcon (*Falco novaeseelandiae ferox*). Although not identified in the eBird desktop survey, there is a possibility that rowi/Ōkarito brown kiwi (*Apteryx rowi,* Threatened-Nationally Endangered) and whio/blue duck (*Hymenolaimus malachorhynchos*, Threatened – Nationally Vulnerable) could be in the area.

Thirteen indigenous species are classified as At Risk, including eight Declining species: pohowera/ banded dotterel (*Charadrius bicinctus bicinctus*), tarāpuka/black-billed gull (*Chroicocephalus bulleri*), kotoreke/marsh crake (*Zapornia pusilla affinis*), pihoihoi/New Zealand pipit (*Anthus novaeseelandiae novaeseelandiae*), tarāpunga/red-billed gull (*Chroicocephalus novaehollandiae scopulinus*), mātātā/South Island fernbird (*Poodytes punctata punctata*), tōrea/South Island pied oystercatcher (*Haematopus finschi*), and kākāriki/yellow-crowned parakeet (*Cyanoramphus auriceps*). Four species are classified as Recovering tōrea pango/variable oystercatcher (*Haematopus unicolor*), Relict māpunga/black shag (*Phalacrocorax carbo novaehollandiae*), kawaupaka/little shag (*Microcarbo melanoleucos brevirostris*), toutouwai/South Island robin (*Petroica australis rakiura*), and Naturally Uncommon Australian coot (*Fulica atra australis*) were also recorded.

Table 3 – Indigenous and exotic bird species recorded on eBird within 10 kilometre radius of the proposed Franz Josef AA, between January 2000 to March 2024 and likelihood of species occurring close to the site. Asterix* species not identified in the desktop survey but could be present based on recent anecdotal records. Threat classifications follow Robertson *et al*. (2021).

Common Name	Scientific Name	Threat Classification	Likelihood
Indigenous			
White heron/kōtuku	*Ardea alba modesta*	Threatened – Nationally Critical	Unlikely
Kea	*Nestor notabilis*	Threatened – Nationally Endangered	Highly likely
Ōkarito brown kiwi/rowi*	*Apteryx rowi*	Threatened – Nationally Endangered	Possible
Southern rock wren/ pīwauwau	*Xenicus gilviventris rineyi*	Threatened – Nationally Endangered	Possible
Blue duck/whio*	*Hymenolaimus malachorhynchos*	Threatened – Nationally Vulnerable	Possible
Grey duck/pārera	*Anas superciliosa*	Threatened – Nationally Vulnerable	Possible
Long-tailed cuckoo/koekoeā	*Eudynamys taitensis*	Threatened – Nationally Vulnerable	Possible
South Island kaka/kākā	*Nestor meridionalis meridionalis*	Threatened – Nationally Vulnerable	Likely
Bush falcon/kārearea	*Falco novaeseelandiae ferox*	Threatened – Nationally Increasing	Likely
Banded dotterel/pohowera	*Charadrius bicinctus bicinctus*	At Risk – Declining	Likely
Black-billed gull/tarāpuka	*Chroicocephalus bulleri*	At Risk – Declining	Likely
Marsh crake/kotoreke	*Zapornia pusilla affinis*	At Risk – Declining	Possible
New Zealand pipit/pīhoihoi	*Anthus novaeseelandiae novaeseelandiae*	At Risk – Declining	Likely
Red-billed gull/tarāpunga	*Chroicocephalus novaehollandiae scopulinus*	At Risk – Declining	Likely
South Island fernbird/mātātā	*Poodytes punctata punctata*	At Risk – Declining	Unlikely

Common Name	Scientific Name	Threat Classification	Likelihood
South Island pied oystercatcher/tōrea	*Haematopus finschi*	At Risk – Declining	Possible
Yellow-crowned parakeet/kākāriki	*Cyanoramphus auriceps*	At Risk – Declining	Possible
Variable oystercatcher/tōrea pango	*Haematopus unicolor*	At Risk – Recovering	Unlikely
Black shag/māpunga	*Phalacrocorax carbo novaehollandiae*	At Risk – Relict	Possible
Little shag/kawaupaka	*Microcarbo melanoleucos brevirostris*	At Risk – Relict	Unlikely
South Island robin/toutouwai	*Petroica australis rakiura*	At Risk – Relict	Highly likely
Australian coot	*Fulica atra australis*	At Risk – Naturally Uncommon	Possible
Australasian shoveler/kuruwhengi	*Spatula rhynchotis*	Not Threatened	Possible
Bellbird/korimako	*Anthornis melanura melanura*	Not Threatened	Highly likely
Brown creeper/pipipi	*Mohoua novaeseelandiae*	Not Threatened	Highly likely
Grey duck – mallard hybrid	*Anas superciliosa × platyrhynchos*	Not Threatened	Likely
Grey teal/tētē-moroiti	*Anas gracilis*	Not Threatened	Possible
Grey warbler/riroriro	*Gerygone igata*	Not Threatened	Highly likely
Morepork/ruru	*Ninox novaeseelandiae novaeseelandiae*	Not Threatened	Highly likely
New Zealand kingfisher/kōtare	*Todiramphus sanctus vagans*	Not Threatened	Unlikely
New Zealand pigeon/kererū	*Hemiphaga novaeseelandiae*	Not Threatened	Likely
Paradise shelduck/pūtangitangi	*Tadorna variegata*	Not Threatened	Likely
Pūkeko	*Porphyrio melanotus melanotus*	Not Threatened	Likely
South Island rifleman/tītitipounamu	*Acanthisitta chloris chloris*	Not Threatened	Likely
Shining cuckoo/pīpīwharauroa	*Chrysococcyx lucidus lucidus*	Not Threatened	Likely
Silvereye/tauhou	*Zosterops lateralis lateralis*	Not Threatened	Highly likely
South Island fantail/pīwakawaka	*Rhipidura fuliginosa fuliginosa*	Not Threatened	Highly likely
Southern black-backed gull/karoro	*Larus dominicanus dominicanus*	Not Threatened	Likely
Spur-winged plover	*Vanellus miles novaehollandiae*	Not Threatened	Possible
Swamp harrier/kāhu	*Circus approximans*	Not Threatened	Highly Likely

Common Name	Scientific Name	Threat Classification	Likelihood
South Island tomtit/ngirungiru	*Petroica macrocephala macrocephala*	Not Threatened	Highly likely
Tūī	*Prosthemadera novaeseelandiae novaeseelandiae*	Not Threatened	Highly likely
Welcome swallow/warou	*Hirundo neoxena neoxena*	Not Threatened	Highly likely
Western weka	*Gallirallus australis australis*	Not Threatened	Highly likely
Australasian little grebe	*Tachybaptus novaehollandiae novaehollandiae*	Non-resident Native – Coloniser	Unlikely
Exotic			
Chaffinch	*Fringilla coelebs*	Introduced and Naturalised	Likely
Common redpoll	*Acanthis flammea*	Introduced and Naturalised	Unlikely
Dunnock	*Prunella modularis*	Introduced and Naturalised	Likely
Eurasian blackbird	*Turdus merula*	Introduced and Naturalised	Likely
Goldfinch	*Carduelis carduelis*	Introduced and Naturalised	Unlikely
Greenfinch	*Chloris chloris*	Introduced and Naturalised	Unlikely
House sparrow	*Passer domesticus*	Introduced and Naturalised	Likely
Mallard	*Anas platyrhynchos*	Introduced and Naturalised	Unlikely
Skylark	*Alauda arvensis*	Introduced and Naturalised	Likely
Song thrush	*Turdus philomelos*	Introduced and Naturalised	Likely
Starling	*Sturnus vulgaris*	Introduced and Naturalised	Likely
Yellowhammer	*Emberiza citrinella*	Introduced and Naturalised	Unlikely

8.1.1 Kea and kākā

Mature broadleaved and mixed podocarp-southern rātā/kāmahi forest provides foraging, roosting and breeding habitat for kea and kākā/South Island kaka (Higgins 1999; Powlesland *et al.* 2009). Kea will forage across all sub-alpine and alpine habitats within the amenity footprint and are recorded to have high presence around the Franz Josef Glacier car park. Due to the range of habitat throughout the AA, kea may breed under logs, in holes or amongst boulders of old moraines within the proposed footprints of AC towers from lower Rope Creek to Crawford Knob between July and February (Higgins, 1999). Kākā/South Island kaka are highly likely to forage amongst the mature southern rātā/kāmahi forest within the AA, and may use mature and dying trees within the footprint of the proposed tower at lower

Rope Creek between July and February for breeding (Higgins, 1999). Without a detailed survey of the tower footprints, the likelihood of either species nesting within the site cannot be evaluated.

8.1.2 Ōkarito brown kiwi

Although the desktop survey did not record any rowi/Ōkarito brown kiwi, the lowland seral broadleaved and mixed podocarp forest on lower river flats and moraines in the amenity footprint does provide favourable foraging and breeding habitat for rowi/Ōkarito brown kiwi (Marchant and Higgins 1990). In 2018, Operation Nest Egg released 106 rowi/Ōkarito brown kiwi near Lake Matheson and Lake Gault in 2018 (Goodwin 2022; Radio New Zealand 2018). It is unknown if rowi/Ōkarito brown kiwi are utilising habitat within the proposed amenity area.

8.1.3 Yellow-crowned parakeet

Kākāriki/yellow-crowned parakeet have localised presence in the Ōkarito Forest and Whataroa River catchment of South Westland. An eBird observation in 2024 reported a small flock of four kākāriki/yellow-crowned parakeet feeding on tōtara (*Podocarpus totara*), eight kilometres north of the site. Kākāriki/yellow-crowned parakeet may be found utilising podocarp forest within the AA, especially in areas where Hall's tōtara and southern rātā are dominant, for foraging, roosting and possibly breeding between October to March (Heather & Robertson, 2000).

8.1.4 South Island robin and long-tailed cuckoo

Kakaruai/South Island robin are highly likely to forage, roost and breed within the seral lowland broadleaved forest surrounding the Franz Josef Glacier car park and within the proposed location of the base building and in forest surrounding the AC tower on the roche moutonnée. This habitat will also provide foraging and breeding habitat for pīpipi/brown creeper (*Mohoua novaeseelandiae* Not Threatened) who are the host of parasitic koekoeā/long-tailed cuckoo.

8.1.5 Southern rock wren and New Zealand pipit

A pair of pīwauwau/southern rock wren have been observed in similar alpine habitat, six kilometres from the AA on the Burster Range. Subalpine tussocklands, low-growing alpine vegetation, extensive boulder fields and scree slopes within the upper AA will provide foraging and breeding habitat for pīwauwau/rock wren. Pīwauwau/southern rock wren may be breeding within the footprints of proposed towers from Coulter Ridge to Crawford Knob between October to February (Higgins *et al*. 2001). Pīhoihoi/New Zealand pipit have also been recorded within five kilometres of the AA footprint on surrounding high-altitude ridgelines. Pīhoihoi/New Zealand pipit may also utilise these habitats for foraging and breeding between August and March (Higgins *et al*. 2006).

8.1.6 Bush falcon

Kārearea/bush falcon will likely utilise all habitats within the AA for hunting, roosting and breeding. Kārearea/bush falcon will breed up to 1,500 metres on slopes, rocky outcrops, within tussock lands and in epiphytes of old trees (Fox 1977). Kārearea/bush falcon may be breeding within the footprint of towers at roche moutonnée, lower Rope Creek, and Coulter Ridge between August and March (Kross *et al*. 2013). However, without a detailed survey of each tower's footprints, the likelihood of nesting within the site cannot be evaluated.

8.1.7 Morepork

Ruru/morepork (*Ninox novaeseelandiae novaeseelandiae* Not Threatened) are highly likely to forage, roost and breed within forest habitat of the AA. Ruru/morepork are nocturnal and roost in tree cavities or thick vegetation by day. Due to their inactivity during the day, they could be displaced and disturbed during vegetation clearance associated with the AC base and tower at lower Rope Creek (Heather & Robertson 2000).

8.1.8 Blue duck

Breeding whio/blue ducks tend to occupy a single stretch of river territory year after year. A single pair was recorded in the desktop survey in the Waiho River in 2015. However, it is unknown if they were breeding or juveniles looking for new territories. It is possible that adult and juvenile whio/blue ducks may disperse into the Waiho River from surrounding catchments.

8.1.9 River birds

Waiho River is a braided river that passes through the AA. Braided river birds, including pohowera/banded dotterel, tarāpuka/black-billed gull, tōrea/South Island pied oystercatcher and tōrea pango/variable oystercatcher may forage and breed on gravel islands within the AA between August and February. Māpunga/black shag may also use the to forage, roost and breed if trees overhang areas of open water.

8.1.10 Common forest birds

Forest birds that are classified as Not Threatened, such as tūī (*Prosthemadera novaeseelandiae novaeseelandiae*), ngirungiru/tomtit (*Petroica macrocephala macrocephala*), kererū /New Zealand pigeon (*Hemiphaga novaeseelandiae*), and western weka (*Gallirallus australis australis*) will forage, roost and breed throughout forested areas within the AA particularly within the seral lowland broadleaved forest surrounding the Franz Josef glacier walk carpark and mixed podocarp-southern rātā/kāmahi forest.

8.1.11 Wetland and cryptic species

It is unlikely that Peter's Pool and associated avifauna will be impacted by any proposed works or operation associated with the AC, as this site is already being heavily visited by tourists. However, if works are within 100 metres of areas containing *Carex* or *Juncus* species, then wetland birds present to forage, roost and breed could be displaced and disturbed.

8.2 Bats

Long-tailed bats (*Chalinolobus tuberculatus*, Threatened-Nationally Critical) are present within the West Coast Region (O'Donnell *et al*. 2023). The Department of Conservation bat distribution database holds five records from 2021 of long-tailed bats within 19 kilometres of the AA in Westland Tai Poutini National Park. The closet record to the site is 16 kilometres north. The home range of long-tailed bats can be up to 19 kilometres (O'Donnell 2005) and this places the site within the home range of this bat sighting. No bat surveys have been undertaken in the Waiho Valley. However, mature southern rātā and kāmahi trees with up to c.90 centimetres diameter and other mature forest trees, including rimu and Hall's tōtara, may provide potential bat roosting habitat for long-tailed bats within the AA footprint. The Waiho River may also be used as a flyway for bats or be utilised for aquatic insect foraging (Rockell *et al*. 2007).

8.3 Terrestrial invertebrates

The GBIF search retrieved records of 453 terrestrial invertebrates that met the search terms. The invertebrate fauna was characterised mainly by beetles, flies, and moths. Of these, 421 had been identified to a level at which they could be assessed. Notable species are presented in Table 4.

Table 4: Notable invertebrates recorded within five kilometres of the AA.

Species Name	Common Name	Threat Classification	Notability	Likelihood of Being on-Site
Ooperipatellus sp.	Ngaokeoke/peripatus	Likely to be Not Threatened or not assessed	Species are often locally endemic and sensitive to habitat loss	High
Geodorcus helmsi	Helms' stag beetle	Not assessed	Protected under the Wildlife Act (1953)	High
Leptotarsus ferruginosus	Orange cranefly	Not assessed	May be locally endemic; few official records	High
Kiwaia caerulea	Twirler moth	Not assessed	Locally endemic	High
Synthetonychia glacialis	Harvestman	Not assessed	Only one ever found, on Franz Josef glacier.	High
Vanessa gonerilla	New Zealand red admiral	Not assessed	Declining due to habitat loss	Low
Nuncia coriacea	Short-legged harvestman	Not assessed	Locally endemic, may be vulnerable to habitat loss	High

Three moths in the genus *Kiwaia* have only been officially recorded in the area local to Franz Josef and may have a very localised distribution. The ngaokeoke specimen found is reasonably likely to be a known but undescribed species, as the ngaokeoke fauna of Aotearoa New Zealand is badly under-described.

The site is within the range of giant carnivorous land snails (*Powelliphanta* spp.), and contains potential suitable habitat for them. Many species of carnivorous land snail are At Risk or Threatened, and all within the genus are protected under the Wildlife Act. None were found within the GBIF search, but observations on nearby Fox Glacier suggest high likelihood of them being on-site.

A 2020 study collected invertebrates from five different phyla (Tardigrada, Rotifera, Platyhelminthes, Arthropoda, and Nematoda), including at least 12 new species, in the ice on Fox, Whataroa, and Franz Josef glaciers. Of these phyla, only Rotifera have previously been found associated with glaciers. The study indicated extraordinarily high diversity of microinvertebrate (microscopic invertebrate) fauna on these glaciers (Shain *et al.* 2021).

Powelliphanta spp. and Helms' stag beetle (*Geodorcus helmsi*) are protected under the Wildlife Act (1953); any activities which threaten to harm or disturb these species are not permitted without a Wildlife Act Authority. In some circumstances this can include surveys. Applications for a Wildlife Act Authority can take many months to approve.

The site contains important invertebrate habitat, unusual in the presence of both glacier ice and rainforest. The Franz Josef invertebrate fauna is poorly studied, but the little research that has been undertaken suggests high biodiversity and localised endemicity of species. Some species appear highly-specialised to live in the glacier environment or cold subalpine rainforest, such as the tiny harvestman *Synthetonychia glacialis*, one of only five described species in the family Synthetonychiidae, all of which are only found in New Zealand.

The forest habitat on-site contains the most well-studied of the invertebrate fauna, as the West Coast rainforest invertebrate fauna is reasonably well known. This fauna is highly diverse and contains notable species, including protected Helms' stag beetles. However, the seral vegetation, boulderfield, grassland and herbfields, and all areas with large above-ground rock surfaces are likely to harbour fauna which is less well-known and may be more vulnerable to habitat loss, being isolated from other habitats. Locally endemic, highly-specialised species are likely to be present in these habitats.

8.4 Lizards

The desktop assessment is limited, due to the lack of knowledge of surrounding indigenous lizard species in Westland. This is because of a lower population density and fewer urban centres, more intact vegetation cover, and a lack of formal surveys, all of which contribute to fewer observations within the area. In addition, lower population densities result in fewer incidental observations in the wider area. In intact vegetation, such as tall podocarp forest, detection of any lizard species is difficult without intensive surveys. A lack of intensive formal surveys also contributes to a lack of knowledge surrounding the biodiversity potentially present. Recent efforts have been made to increase the understanding of herpetofauna on the West Coast through Jobs for Nature funding, and alpine gecko surveys (Lettink 2023). In addition, there has been substantive effort made towards resolving the taxonomy of skink species within the area, through DOC's data deficient lizard survey work. While observations of lizards in South Westland are increasing, there are still significant knowledge gaps, which is a limitation to the assessment in this report and this limitation should be considered.

There have been very few observations recorded both historically and recently, making it difficult to determine the species present and their likelihood within the AA. For this reason, a number of different lizard species have been included in this assessment that have the potential of being present, but their distributions and ecology has not yet been resolved sufficiently to discount the probability of their presence within the AA and surrounding area (Table 5). Specifically, species known to inhabit the western side of the main divide were considered during this assessment, due to the Southern Alps acting as a significant geographical barrier to eastern species.

The assessment found that at least two species have been recorded in the wider area, and these species are therefore considered the most likely to be present based on those records. These are the broad-cheeked gecko (*Mokopirirakau* 'Ōkārito'; Threatened - Nationally Vulnerable) and Ōkarito/ Pakihi skink (*Oligosoma* aff. *infrapunctatum* 'Ōkārito'; Not Assessed[3]).

The broad cheeked gecko typically inhabits areas of scrub, shrubland, indigenous forest as well as sub-alpine rocky outcrops and boulder fields. It is a species that has been recorded most recently (2020) within 20 kilometres of the AA. Prior to this, broad-cheeked gecko was only known from a small number of sightings around Ōkārito (Lettink 2023). Older observations of 'forest gecko' were also recorded within database search range. Forest gecko are closely genetically related to, and resemble, the broad-cheeked gecko, but their range does not extend to Franz Josef and the surrounding areas. These observations are likely to be broad-cheeked gecko. It is possible that broad-cheeked gecko are present at the AA within the areas described as (Podocarp-southern rātā)/kāmahi forest,seral low broadleaved species forest, high altitude short grassland and herbfield, boulderfield with short herbaceous vegetation. The species has been found at elevations up to 1,300 masl.

Furthermore, an unidentified *Mokopirirakau* gecko was also seen by mountaineers near Fox Glacier in 2021. It is understood that survey efforts were carried out in the area in attempt to identify this species but nothing was detected (Carey Knox pers. comm., 2021).

[3] Likely to be nominated for Threatened – Nationally Critical status in the next assessment.

Table 5 - Results of the Department of Conservation Bioweb herpetofauna database search on the western side of the main divide of the Southern Alps, within the Westland/South Westland District. Conservation status as per Hitchmough *et al.* (2021). Data older than 20 years was included in analysis because of the lack of records and survey effort within the West Coast area generally.

Species	Common Name	Conservation Status	Record Distance (km) and year	Preferred Habitats
Mokopirirakau 'Ōkārito'	Broad-cheeked gecko	Threatened - Nationally Vulnerable	17.9 km (2020)	Scrubland, pākihi, native forest, alpine and subalpine rocky scrubland and boulderfield
Oligosoma aff. *infrapunctatum* 'Ōkārito'	Ōkarito skink/Pakihi skink	Threat classification not assigned (pers comm. Marieke Lettink, 2024)	No records	Poorly known - forest clearings and edges, scrubland and pākihi wetland (in lowland and montane areas)
Woodworthia 'Southern Alps'	Southern Alps gecko	At Risk - Declining	12.9 km (2005)	Rocky scrubland, talus, boulderfield, scree, stony river terraces and creviced rock outcrops (from lowland and montane valleys to alpine areas, <1,900m)
Oligosoma aff. *polychroma Clade 4*	Canterbury grass skink	At Risk - Declining	24.4 km (2005)	Range of grassy and rocky environments (from the coast to alpine)
Oligosoma pluvialis	Te Wāhipounamu skink	At Risk - Declining	No records	Range of grassy areas such as scrublands, grasslands, tussock lands, herb fields as well as rocky areas (Screes, talus, vertical rock walls)
Oligosoma aff. *inconspicuum* 'Oteake'	Oteake skink	Threatened - Nationally Vulnerable	No records	Vegetated boulderfield (particularly with snow totara) and fellfield (from alpine areas, 1,000-1,400m)
Naultinus tuberculatus	West Coast green gecko	Threatened -Nationally Vulnerable	51.7 km (1985)	Scrubland, forest, rocky shrubland and fernland (from the coast to subalpine areas). Often found in trees or shrubs like mānuka, kānuka, mingimingi, matagouri, low-growing shrubs and other dense vegetation. May seek refuge under rocks.

Southern Alps gecko (*Woodworthia* 'Southern Alps'; At Risk – Declining) typically inhabits areas with rocky outcrops, boulderfields or along river terraces. Furthermore, Southern Alps gecko can be found from montane valleys to alpine areas so may also be present within higher altitude areas of the AA. They may possibly be present within the AA in the areas described as seral vegetation on glacially scoured schist, high altitude short grassland and herbfield, boulderfield with short herbaceous vegetation. Southern Alps gecko are typically found east of the main divide, but may be present west of the main divide in selected locations.

The Ōkarito/Pakihi skink (*Oligosoma* aff. *infrapunctatum* '*Ōkārito*'; Not Yet Assessed) is a part of the speckled skink cryptic species complex (*O.*aff. *infrapunctatum*). This species complex is incredibly difficult to identify without detailed morphological and/or DNA analysis. Pakihi skink is poorly understood due to the limited data and information surrounding its population density and range. Therefore, despite only previously being known to exist in Ōkarito on the West Coast, there is a possibility that it exists elsewhere. Observations of 'Newmans speckled skink' (*O. newmani*) have previously been recorded within the area. This species is also a part of the speckled skink complex, but is not considered to extend south of Hokitika. Therefore, it is likely that these observations were Ōkarito skink. The species habitat use is also poorly known but it is thought that preferences for these species is usually within forest clearings and edges, as well as areas of scrub or shrubland. Therefore, the Ōkarito/Pakihi skink may possibly be present within the AA in the areas described as (Podocarp-southern rātā)/kāmahi forest, upland southern rātā-kāmahi forest, seral low broadleaved species forest and *Dracophyllum-Chionochloa* scrub/grassland mosaic.

Oteake skink (*O.* aff. *inconspicuum* 'Oteake'; Threatened - Nationally Vulnerable) is known to be present in the Oteake Conservation Park, as well as the Solution Range in Westland. The range and distribution of this species is so poorly understood that it is possible the distribution of Oteake skink could extend to within the AA. Habitat preferences for this species include tussockland, grassland and boulderfields as well as dense vegetation including *Dracophyllum* and snow tussock. They may possibly be present within the AA in the areas described as seral vegetation on roche moutonnée, seral vegetation on glacially scoured schist and *Dracophyllum-Chionochloa* scrub/grassland mosaic and boulderfield with short herbaceous vegetation.

Canterbury grass skink (*O.* aff. *polychroma* Clade 4; At Risk – Declining) typically inhabits modified environments, including agricultural areas, but is also abundant in rocky environments from the coast to alpine habitats. The AA contains rocky habitat suitable for this species, and it is possible this species could detected within the vegetation types *Dracophyllum-Chionochloa* scrub/grassland mosaic, seral vegetation on roche moutonnée as well as un-affected parts of the Waiho River bed, which are infrequently disturbed.

Te Wāhipounamu skink (*O. pluvialis*; At Risk – Declining) is comprised of four previously distinct taxa, which are categorised into two main clades; the eastern clade (Humboldt skink, and pallid skink) and the western clade (Big Bay skink, and mahogany skink). It is unknown which clade could be present, if it is found within the AA, due to the lack of knowledge of the species. Te Wāhipounamu skink may be found within the areas described as, seral vegetation on glacially scoured schist, *Dracophyllum-Olearia* forest and scrub, *Dracophyllum-Chionochloa* scrub/grassland mosaic and seral vegetation on roche moutonnée.

The West Coast green geckos' (*Naultinus tuberculatus*; Threatened -Nationally Vulnerable) distribution is known to be further north of the cableway site from south of Stockton to just south of Hokitika. However, a lack of formal surveys for the species and a record from the 1980s 50 kilometres north of the AA suggests that there is potential for its distribution to extend to at least that point. West Coast green gecko will typically be observed in low stature scrubland, which may be present within the areas described as, *Dracophyllum-Olearia* forest and scrub. West Coast green gecko may also be present in (Podocarp-southern rātā)/kāmahi forest and upland southern rātā-kāmahi forest, but will likely not be detectable in these habitats, and their presence is dependent on site aspect and amount of daylight these areas receive (likely to be south/southwesterly facing). This species is particularly cryptic owing to its longevity, behaviour and habitat use.

8.5 Pest animals

Many exotic mammal species are known to be present in the AA and surrounding landscape, throughout the altitudinal range of the AA. These species include hares (*Lepus europaeus*), brushtail possums (*Trichosurus vulpecula*), mustelids (*Mustela* spp.), European hedgehogs (*Erinaceus europaeus*), rats (*Rattus* spp.), mice (*Mus muscula*), deer (*Cervus* spp.), Himalayan tahr (*Hemitragus jemlahicus*), and chamois (*Rupicapra rupicapra*). It is also possible that feral cats (*Felis catus*) are present.

9.0 Freshwater Habitats

The freshwater habitats at the site can be categorised into three waterway types: Waiho River and small side streams of the Waiho River, the headwater tributary streams within the steep valleys, and the kettle lake.

The freshwater habitats of the Waiho River and the side streams of the Waiho River include the waterways on the Waiho valley floor. The main flow of the Waiho River is a dynamic braided river which has a variety of different habitat types and can support a wide variety of fish species. The small side streams of the Waiho River include waterways that are connected to the main flow of the Waiho River, but exclude the waterways of the steep valley sides. These small side streams are often important habitats for smaller fish and can provide refuges from predation from introduced trout.

The headwater tributary streams within the steep valleys of Franz Josef Glacier Valley include Rope Creek as well as many unnamed streams. The flow of these steep waterways is influenced by rainfall and snow melt, with many of these waterways likely dry during parts of the year. For sections of these waterways that retain water year-round, it is possible that they support fish. However, due to the steepness of the valley streams, they will only have fish that are considered good climbers.

The one kettle lake within the footprint is a relatively small body of water, and is not connected to the Waiho River.

A review of the New Zealand Freshwater Fish Database (Stoffels 2022) shows the Waiho River catchment has not been well surveyed for fish. There are only 13 survey records, with most dated from the 1980s. Of the 13 records, three are located in the upper Waiho River valley upstream of the Franz Josef township, with one being recorded within the Waiho River and the other two recorded in tributaries. There are also two other records within the main flow of Waiho River, however these are recorded in the lower Waiho River floodplain approximately 20 kilometres downstream of the site.

The fish species recorded during these surveys are listed in Table 6 below. Threat classifications for fish are taken from Dunn *et al.* (2018). The 'likelihood' column is the estimated likelihood of each species being detected within the Waiho River within the Franz Josef Glacier Valley. This estimation is based on how frequently they are recorded in the local and wider area, number of individuals found in each survey, and the altitude and distance inland of the site.

Table 6 – Freshwater fish species recorded in the Waiho River catchment, and the likelihood of each species being present in the Waiho River within the Franz Josef Glacier Valley.

Common Name	Scientific Name	Conservation Status	Records	Likelihood in Waiho River and Side Streams	Likelihood in Steep Streams	Likelihood in Kettle Lake
Shortfin eel	*Anguilla australis*	Not Threatened	1	Low	Low	Low
Longfin eel	*Anguilla dieffenbachii*	At Risk - Declining	3	Moderate	Moderate	Moderate
Koaro	*Galaxias brevipinnis*	At Risk - Declining	4	High	High	Moderate
Inanga	*Galaxias maculatus*	At Risk - Declining	3	Very low	Extremely low	Very low
Common bully	*Gobiomorphus cotidianus*	Not Threatened	2	Moderate	Very low	Moderate
Redfin bully	*Gobiomorphus huttoni*	Not Threatened	3	Moderate	Moderate	Very low
Torrentfish	*Cheimarrichthys fosteri*	At Risk - Declining	3	Moderate	Extremely low	Extremely low
Black flounder	*Rhombosolea retiaria*	Not Threatened	2	Very low	Extremely low	Extremely low
Brown trout	*Salmo trutta*	Introduced	1	Moderate	Very low	Moderate

Of the three records within the Franz Josef Glacier Valley, the one located within the Waiho River recorded koaro, and the other two records within the tributaries recorded no fish found. The Waiho River record that observed koaro is undated, but is likely very old based on the record number from the NZFFD; the other two records are from 1985. Koaro are great climbers, and are able to migrate into high alpine streams, and are therefore the most likely fish to be found within the steep tributaries of the Waiho River.

The two records within the main flow of the Waiho River are from 1985 and close to the sea. These two surveys record a variety of fish species, however as these surveys are old and quite a distance downstream from the site (approximately 20 kilometres), it is hard to estimate the current fish populations further upstream. However, as there appears to be no major fish migration barriers (e.g. waterfall or damns) to prevent fish passage from the sea to the Franz Josef Glacier Valley waterways, it is reasonable to assume that the fish species found in the lower Waiho River could also be found in the Franz Josef Glacier Valley section of the Waiho River. The lack of major migration barriers also suggests that fish species in the neighbouring catchments, that have not been recorded within the Waiho Catchment, could also be present within the Waiho River. The two downstream records may not be representative of the current fish population of the Waiho River, so additional fish surveys are required to verify this. It is also likely that the relatively recent introduction of brown trout (*Salmo trutta*) will have impacted the indigenous fish community within the Wahio catchment, outcompeting and preying on galaxias species.

Given the records and the assumptions outlined in previous paragraphs, it is reasonable to assume that there is likely a diverse population of fish within the braided river system and the small side streams of the valley floor of Franz Josef Glacier Valley. It is likely that the steep headwater tributaries within the Franz Josef Glacier Valley, such as Rope Creek, contain only capable climbers such as koaro, assuming there is sufficient water to support them. It is hard to estimate the fish population of the kettle lake, but if it is regularly connected to the Waiho River system it likely contains fish that are able to live in still waters.

10.0 Ecological Significance

10.1 Overview

The proposed Franz Josef AA has very high ecological values, reflecting flora, fauna, and landscape factors. It is an integral part of an intact altitudinal landform and vegetation sequence containing diverse ecosystems from lowland forest to alpine fellfield, that is protected as part of Westland Tai Poutini National Park. In conjunction with the adjoining landscape, it provides habitat for a wide and diverse array of indigenous flora and fauna. As well as this, the lowland areas of the AA are part of the Franz Josef Glacier chronosequence, which is of international scientific importance as one of the best examples of soil and vegetation development following glaciation.

Human development currently within the AA is restricted to the carpark area and walking tracks around the carpark and at Roberts Point. Other than this, modification is limited to the effects of introduced mammals. Only a few hunters and alpinists venture into the remaining areas of the AA. Introduced mammals - herbivores and predators – are the main threat to flora and fauna through broswe and predation. Exotic plants are all but absent over the AA, with the exception of a few herbaceous and grass species within lowland areas and tracks.

The AA also supports many flora and fauna species that are listed as Threatened or At Risk in the New Zealand Threat Classification System. While further targeted surveys are required to determine the actual range of species present, the site visit and desktop analyses indicate that these species incude at least three plant species (and possibly up to nine additional species), at least eight avifauna species, at least one freshwater fish species, and at least one lizard species.

Further surveys are required In order to better understand the presence, abundance and distributrion of flora and fauna, especially for lizards and invertebrates for which there is limited existing local information. These surveys are important to provide a fuller picture of ecoogical values at the AA.

10.2 Significance assessments

Assessments of the ecological significance of the AA using the criteria in the NPS-IB and Westland District Plan are provided in Appendix 3. The AA meets all of the significance criteria under both assessments. This reflects the high values of the AA in relation to representativeness of habitats, presence of threatened flora and fauna species, connectivity and buffering functions, intactness of ecosystems, protected status of the land, and scientific and cultural factors.

Note that only areas within Grey District have been scheduled as Significant Natural Areas in the proposed TTPP. Within the Buller and Westland District an assessment of significance is required to be undertaken at the time any resource consents are applied for in relation to the Ecosystems and Biodiversity Rules.

11.0 Ecological Effects Assessment

11.1 Overview

The works associated with development of the preliminary designed AC include construction of additional car parking, installation of towers, and development of buildings at the base, mid station and top of the AC (Table 7). While the exact footprint of these developments is unknown, it is reasonable to assume that tower placement will require only limited ground disturbance (estimated at 150 m^2 in Table 7), while buildings will require larger footprints of up to 500 m^2.

Table 7 – Expected vegetation and ground disturbance associated with construction of the proposed Franz Josef AC, based on the preliminary design plans.

Location	Vegetation	Proposed Structures	Likely Footprint of Development
Car park area	Seral low broadleaved species forest	Tower, base buildings, carpark	>500 m^2
Roche moutonnee	Bare rock, bryophytes, few small shrubs	Tower	c.150 m^2
Lower Rope Creek	Ridge-crest southern rātā/ kāmahi forest	Tower	c.150 m^2
Upper Rope Creek	*Dracophyllum-Olearia* forest	Tower	c.150 m^2
Coulter Ridge	Mix of bare ground and short tussock grassland	Two towers and mid station buildings	>400 m^2
Hende Ridge	Bare ground, herbfield	Tower	c.150 m^2
Crawford Knob	Boulderfield, herbfield	Tower and buildings	>500 m^2

It is likely that the development will require clearance of more than 2,000 m^2 of indigenous vegetation, and will thus require consent for vegetation clearance under the Westland District Plan and the TTPP.

The ongoing operation of the AC will also have associated effects, especially related to impacts on avifauna and invasion of exotic pest species.

Potential direct ecological effects of the proposed AC are:

- Clearance of indigenous vegetation.
- Clearance of Threatened and At Risk plant species.
- Fragmentation of indigenous vegetation.
- Accidental introduction of pest plants and facilitation of their establishment.
- Loss of avifauna, bat, lizard, and invertebrate habitat.
- Fragmentation of invertebrate habitat.
- Disturbance, injury, or death of fauna during vegetation clearance and construction.
- Beeding failure or behavioural effects on lizards and invertebrates.
- Accidental facilitation of introduced pest animal movement and incursion into habitat.
- Sedimentation and contamination of creeks during earthworks and construction.

Once operational, the proposal would result in an AC and many visitors to Crawford Knob. Potential indirect ecological effects of this land use change at the site are:

- Introduction of pest plant and animal species from visitors.
- Trampling and modification of indigenous vegetation by visitors.
- Ongoing disturbance and strike risk to avifauna from cables and infrastructure.
- Ongoing alteration of invertebrate behaviour from artificial lighting.

These potential effects are described in more detail below, without effects management. It should be noted that many of these effects can be managed with effective conditions of consent including operational and management plans, during construction and operation, such that those effects are capable of mitigation to a minor level; these management measures are considered in Section 12.

11.2 Clearance of indigenous vegetation

Clearance of indigenous vegetation will result from development of carparking, buildings and towers. An estimated total minimum area of 2,000 m^2 of vegetation clearance will result from the development, spread across eight distinct locations of the AA. Apart from the carpark/base building area, all clearance will be in areas of vegetation that are currently intact and unaffected by nearby human modification. The loss of vegetation is very small in relation to the extensive areas of surrounding vegetation communities, and all affected vegetation communities are very well represented in the surrounding landscape and ecological district. The magnitude of effect will be less than minor based upon concept designs for the AC, and construction effects and mitigation would be subject to conditions of consent.

11.3 Clearance of Threatened and At Risk plant species

The proposed AC will result in the clearance of several mature southern rātā (Threatened-Nationally Vulnerable) trees at the Lower Rope Creek location, and several seedlings at the roche moutonnée location. Field observations suggest that it is extremely unlikely that any plants of climbing rātā or white rātā (both Threatened-Nationally Vulnerable) will be disturbed by the development. Southern rātā is extensively present in forests of the Waiho valley, and throughout the forests of South Westland. The loss of the few individuals will have a negligible (less than minor) effect on this species.

As previously noted, a further nine At Risk or Threatened plant species may be present in habitats above the bush line. Further surveys are required to determine if any individuals of these species are present within the development footprint or surrounding areas.

11.4 Fragmentation of indigenous vegetation

Vegetation clearance and construction of AC infrastructure will result in the fragmentation of intact and highly-connected ecosystems. As noted above, all development locations other than the carpark/base building are within intact ecosystems unaffected by nearby human modification. This will have a less than minor effect on vegetation, however, as the affected areas are very small patches relative to the scale of ecosystems present. The scale of disturbance is akin to small-scale natural disturbance events, within a landscape where large-scale mass movement and disturbance is commonplace. Further, the disturbed areas are isolated patches within the landscape, and do not form continuous corridors of disturbance or development that might affect ecological processes such as species dispersal or isolation of habitats.

11.5 Accidental introduction of pest plants and facilitation of their establishment

Exotic pest plant species may be introduced and widely spread through the introduction of seeds on machinery, other equipment and human clothing and footwear. Exotic plant species are virtually absent over most of the AA, but their spread into indigenous habitat can be facilitated by human-caused habitat disturbance, pathways, and tracks. The spread of weeds into intact habitats is strongly related to human disturbance and human presence, both of which will be factors associated with the AC. The AC development will create opportunities for existing exotic plants to penetrate further into the AA and for new species to be introduced, including woody species. This threat will be ongoing during the operation of the AC, and poses a particular threat within the subalpine zones of the mid station and Crawford Knob where visitors will have access to outdoor viewing platforms. This effect would be **significant** without mitigation.

11.6 Loss of avifauna, bat, invertebrate and lizard habitat

11.6.1 Avifauna

Vegetation will need to be cleared to establish the footprint for the base building, mid station building, Crawford Knob building, and each of the AC towers. Vegetation removal will displace birds from the footprint into suitable surrounding habitat. Due to extensive surrounding habitat, there would be a small loss of feeding, roosting and breeding habitat for indigenous avifauna. The magnitude of effect will be **less than minor**.

11.6.2 Bats

Long-tailed bats utilise a wide range of roost trees within 19 kilometres of their home range, frequently switching between roosts. Removing even a single roost tree could be disruptive to a colony of long-tailed bats. Removal of any of the trees confirmed as bat roost trees is prohibited under the Wildlife Act (1953), unless DOC conditions are adhered to. Felling of tree with bats roosting in it would be a significant adverse effect.

11.6.3 Invertebrates

Clearance of rocks, forest, and other vegetation will all reduce habitat available to invertebrates. However, the invertebrates have ample habitat in the surrounding areas, so that the carrying capacity will not be significantly reduced by removing small amounts of vegetation or rocks. However, the exposed rocks and short-stature vegetation are more isolated from other habitats and may harbour invertebrate species that are limited in their ability to disperse between habitats. Without knowing which invertebrates are present and the types and quantities of habitat to be removed, the magnitude of effect cannot be quantified.

11.6.4 Lizards

Lizard habitat is found throughout the site and loss of habitats may occur as a result of the proposal. Habitat loss could primarily affect areas of forest and scrub vegetation, where geckos and skinks may be present. Vegetation removal and earthworks may result in permanent habitat loss and fragmentation for indigenous lizards at this site. The magnitude of effect will be minor.

11.7 Fragmentation of invertebrate and lizard habitat

Many of the invertebrates identified in Table 4 are limited in their ability to disperse across barriers or over distance. Removal of even a small amount of habitat can fragment the remaining habitat, particularly if removed sections are linear. Increased barriers to movement can reduce the viability of small, isolated populations and make them more vulnerable to habitat loss and predation, as well as edge effects such as desiccation from increased exposure to wind and sun. The size of this effect cannot be quantified without knowing what lizards are present and the specific locations and quantities of habitat removal.

If a Threatened – Nationally Vulnerable species is occupying these habitats, this effect is likely to be **more than minor** without mitigation.

11.8 Disturbance, injury, or death of fauna during vegetation clearance and construction

11.8.1 Avifauna

Any construction, vegetation clearance and earthworks associated with the AC development planned to occur during the avifauna breeding season (August-March), will disturb nesting avifauna within and adjacent to all site footprints. Disturbance to nesting avifauna will result in possible nest abandonment, injury, or mortality. While this effect is likely to be minor, a greater level of effect is possible if Threatened or At Risk species were affected.

Any noise and movement associated with construction and earthworks could displace any Threatened or At Risk species utilising the footprint for foraging or roosting into suitable surrounding habitat. This effect is likely to be **less than minor.** However, if birds are nesting, this disturbance can result in possible nest abandonment, increased stress on the birds and chilling or overheating of eggs and chicks. While this effect is likely to be minor, a greater level of effect is possible if Threatened or At Risk species were affected.

If rowi/Ōkarito brown kiwi and western weka are within the construction footprint and surrounding area, there is a risk of individuals fall into pits dug for the bases of towers or trenches for cables (Powlesland 2009). Without mitigation this effect could be **significant**.

11.8.2 Bats

If bats are present within the valley, felling potential roost trees with bats could result in injury or mortality. As many bats can be found in one roost, felling even one tree with bats could harm and/or kill enough bats to adversely affect the local population. This risk is even higher during the pupping season (early summer). The magnitude of this effect is **significant** without mitigation.

11.8.3 Invertebrates

Vegetation clearance will cause harm and death to invertebrates that are living in the vegetation, especially if it is chipped. This effect is difficult to quantify without knowing what invertebrates are present and how much vegetation of each type is to be cleared, but could be **more that minor.**

Dust and vibration caused by earthworks may cause harm to invertebrates and affect their ability to communicate and their sensory abilities. Without mitigation this effect is likely to be **minor.**

11.8.4 Lizards

Disturbance to lizards during vegetation clearance, construction and earthworks during AC development may include dust, vibration, and noise. This disturbance is likely to disrupt normal behaviour, including social dynamics in lizard populations adjacent to the AC construction footprint as a result of construction activity. There will also be ongoing disturbance to lizards through Effects from vibration and noise is unknown and not well researched. This effect could be **significan**t to Threatened species (if present) without mitigation.

11.8.5 Fish

Works within or close to the water could result in fish injury or death, deterring fish from using spawning or feeding habitat or migratory routes, or the destruction and/or degradation of their habitat.

The effect of this will depend on several factors including the waterway being worked in, the presence of Threatened and At-Risk freshwater species in the waterway, and if the works coincide with fish spawning seasons (for most species, this is between August and February).

11.9 Breeding failure and behavioural effects

11.9.1 Invertebrates

Stress and disturbance caused by the increase in human activity, machinery, vibration, dust, construction, and earthworks is likely to impact invertebrate behaviour. It may reduce the amount of time spent active, including reducing foraging, hunting, or breeding. Stress can seriously impact sensitive species such as ngaokeoke. Artificial lighting will also affect the behaviour of nocturnal flying insects, many of which are biologically compelled to seek out light sources. This may include rare, dispersal-limited species which do not fly well but still seek out light. Artificial lighting can severely impact the behaviour and energy budgets of positively phototactic insects. This effect cannot be quantified without knowing the extent to which artificial lighting will be used, if it will be used at all.

11.9.2 Lizards

Any vegetation clearance, construction and earthworks associated with AC development may lead to temporary effects on behaviour of lizards and/or social interactions, such as increased stress, leading to reduced population functionality, such as poor breeding and low population recruitment. This effect is likely to be **more than minor** without mitigation. Ongoing effects from artificial lighting (if used) may disrupt the behaviour of nocturnal or semi-nocturnal gecko species, but this effect cannot be quantified without knowing the extent to which artificial lighting will be used, if at all.

11.10 Accidental facilitation of introduced pest animal movement and incursion into habitat

Pest animals are strongly associated with humans, and their movement into and around indigenous habitat can also be facilitated by human-caused habitat disturbance, pathways, and tracks. Human food, including dropped crumbs, discarded crusts, and litter are highly attractive to vespulid wasps, rats, and other pest animals. Humans can also accidentally carry pests such as mice and invertebrates in their belongings, which may then introduce themselves into the area. While mice are already likely to be on-site, there may be pockets of low or no mouse activity which are repopulated by humans. The genetic diversity increased by new mice may also restore vigour among the local mouse population. Structures and buildings are readily used by rodents and these new habitats will enable larger rodent populations to persist. Vespulid wasps are a greater risk, as human tracks and food may cause them to penetrate further into the forest, in greater numbers than they were previously. This effect is potentially **significant** without mitigation.

11.11 Sedimentation and contamination of creeks during earthworks and construction

Any construction and development within and adjacent to the waterways will temporarily increase the amount of suspended sediment within waterways, and is likely to result in a reduction in aquatic habitat quality during, and immediately after, construction. High sediment levels negatively affects the survival of eggs and larvae of freshwater fauna, by smothering their instream habitat, reducing their ability to hunt visually, and by irritating delicate gill structures. These effects are likely to be short term in the high-rainfall environment of the AA, and are unlikely to be of greater magnitude or consequence than the regular natural sediment discharge events resulting from natural disturbance. The use of heavy machinery close to waterways also presents the risk of contamination if there is an accidental spill of fuel or hydraulic oil.

11.12 Ongoing disturbance to fauna

Avifauna

Noise and movement associated with the ongoing operation of the cableway will likely deter any avifauna from nesting close to the AC base and towers during the breeding season. Birds may also be deterred from foraging in these areas. However, there are areas of suitable habitat within the surrounding area and the magnitude of effect will be **less than minor.**

Operation of the cableway will result in greater use of the site by visitors, with associated increases in noise, visual disturbance, and interaction with inquisitive birds, such as kea. The indigenous forest birds that currently utilise the vegetative habitat surrounding the proposed AC base building footprint are already subject to disturbance through the site being a busy carpark and accessway to the glacier. Increased human activity is likely to have a **less than minor effect** on local avifauna. However, increased human activity in the area will likely attract more kea to the site, due to their innate curiosity and developed association with people and food. As a result of increased human interactions, kea are more at risk of injury and mortality associated with vehicles and being fed by visitors (Weston *et al*., 2023). This effect could be **significant** without mitigation.

11.12.1 Strike risk

Avifauna

Above-ground electricity transmission lines are a known hazard for flying birds, especially through electrocution (Kross 2014; Powlesland 2009). The bird taxa most susceptible to flying into lines are large, heavy-bodied birds with large wingspans and a lack of agility which include waterfowl, shorebirds, and raptors (Powlesland, 2009). Cables hanging across the Waiho River valley will be associated with a low to moderate bird strike risk. Whereas, the reflection off the glass of the cabins and base stations may lead to window strikes. Bird species utilising this aerial space for movement up and down the valley include kārearea/bush falcon, kereru/New Zealand pigeon, kāhu/swamp harrier, karoro/southern black-backed gull, and māpunga/black shag. Cabins ascending up the Waiho River valley to Crawford Knob may also experience bird strike from forest avifauna, such as kererū/New Zealand pigeon and kākā, which fly above the canopy to foraging sites (Higgins 1999). Bird strike can result in injury or mortality. This effect could be **more than minor.**

11.13 Trampling and modification of indigenous vegetation by visitors

Visitors entering natural areas adjoining the mid station and Crawford Knob could result in trampling and modification of indigenous vegetation. However, the proposed restriction of visitor access beyond formed viewing platforms to concessionaires and equipped private alpine recreationists means this effect will be minor.

11.14 Overall level of effect

The potential extent of adverse effects resulting from the proposed AC is summarised in Table 8. It is noted that further surveys of flora and fauna would be required to confirm these. It is also noted that the concept plans are sufficiently adaptable to allow for potential movements in locations of AC towers and infrastructure to accommodate any local ecological constraints that may emerge from these future surveys.

Table 8 – Potential effects of the proposed AC at Franz Josef on ecological features and values, and likely extent of effects before mitigation. Effects marked with an asterisk require further survey to be confident.

Effect	Likely Extent of Effect Before Mitigation
Loss of indigenous vegetation	Less than minor
Loss of Threatened and At Risk plant species	Less than minor*
Fragmentation of indigenous vegetation	Less than minor
Accidental introduction of pest plants and facilitation of their establishment	Significant
Loss of avifauna, bat, lizard and invertebrate habitat	Less than minor
Fragmentation of invertebrate habitat	More than minor*
Disturbance, injury or death of fauna during vegetation clearance and construction	Potentially significant for avifauna depending on threat classification (and possibly bats*)
Beeding failure or behavioural effects on lizards and invertebrates	Minor
Accidental facilitation of introduced pest animal movement and incursion into habitat	Significant
Sedimentation and contamination of creeks during earthworks and construction	Minor
Ongoing disturbance to fauna	Significant for human interaction with kea; More than minor for strike risk to avifauna from AC
Trampling of indigenous vegetation by visitors	Minor

12.0 Effects Management

The NPS-IB requires all significant adverse effects of development on indigenous biodiversity to be managed by applying the effects management hierarchy, and all non-significant adverse effects to be managed to give effect to the objective and policies of the NPS-IB. The objective is to maintain indigenous biodiversity across Aotearoa New Zealand so that there is at least no overall loss in indigenous biodiversity after the commencement date.. Additional requirements apply to scheduled Significant Natural Areas (SNA), but the proposed AA is not within a scheduled SNA.

It is noted that no areas within Westland have been scheduled as SNA in the Westland District Plan or the proposed TTPP. If the current version of the NPS-IB remains in force, areas of DOC-administered land in Westland will almost certainly in time be mapped as SNA, and would need to be considered as such in resource consent applications at that time. If Westland National Park was scheduled as an SNA in the future, then when considering management of the effects of the proposed AC on SNA each of the adverse effects identified in Clause 3.10(2) of the NPS-IB would need to be avoided. Although not forming part of the present analysis, an overview of how each of these effects on SNA could be avoided is included in Appendix 4.

This section outlines options to manage the potentially adverse ecological effects of the proposed AC development.

12.1 Avoidance and minimisation measures

12.1.1 Vegetation and ground disturbance

All development on old moraines at the southern end of the AA should be avoided, as these have high values as part of the Franz Josef Glacier chronosequence. Peter's Pool should also be avoided, due to its high ecological values as an example of a recent kettle lake ecosystem. The proposed development footprint does not currently include these areas.

All vegetation and ground disturbance should be restricted to the smallest possible footprint required to establish towers and buildings.

If possible, any Threatened or At Risk plant species found above the bush line within the development footprint should be avoided by adjusting the location of infrastructure. This is especially important if localised populations of these species are found. This is not possible for the tower location at Lower Rope Creek site that contains southern rātā.

At the mid station and Crawford Knob station, construction of facilities should provide decks for viewing and not let visitors go off-site into areas of sensitive indigenous alpine vegetation and habitat.

12.1.2 Avifauna

<u>Avifauna Disturbance/Breeding Season Avoidance</u>

Proposed works could occur during the non-breeding season (April - July) in order to minimise any direct adverse effects on avifauna. If works are undertaken outside of the breeding season, the effects of the proposed works will be **less than minor.**

Construction works and vegetation clearance may need to occur within the avifauna breeding season (August-March), due to multiple proposed amenities being above the snow line between April and July. As construction works cannot be avoided during the breeding season, a site survey for breeding avifauna should be undertaken by a suitably-qualified and experienced ecologist within eight days prior to works commencing within a new footprint. Most breeding indigenous birds are protected under the Wildlife Act (1953). If breeding indigenous birds are present, the suitably qualified and experienced ecologist will advise an appropriate management strategy. Depending on species, this may result in a delay in works or setback buffer from the active nest site until the chicks have fully fledged. Additionally, further avifauna surveys will be necessary if the works cease for more than eight consecutive days during the breeding season, or before new sites are worked on during the breeding season. If adopted, the appropriate strategy advised by the suitably qualified and experienced ecologist should make effects of the proposed works **less than minor.**

<u>Bird Strike</u>

Monitoring of bird strike will be difficult due to carcasses being scavenged or very difficult to find in dense forest vegetation. Nevertheless, the cableway on which the cabins are suspended will be of a thick diameter (e.g. 50 millimetres; Grunberlin 2024) which will provide a visual cue to birds flying through the area, allowing for evasive behaviour. The cabins will also be slow moving, allowing birds to navigate the moving objects. However, cabin windows and the base station glass may reflect the surrounding environment (e.g. trees) and sky allowing birds to believe the habitat is continuous leading to bird strike. It is recommended that glass windows are strategically decaled or UV-reflecting film to reduce the probability of bird strike within the AC (Best Practices Glass 2016; Dey 2021).

Bird species utilising this aerial space for movement up and down the valley include kārearea/bush falcon. With mitigation in place, the level of effect is considered minor.

Limiting Ongoing Impacts on Avifauna

It is recommended that signage is installed at the AC base building, carpark and in cable way cabins to inform of the avifauna within the area and educate on how to interact with kea (e.g. not to be fed or approached). Additionally, to ensure effects on kea from feeding are largely avoided, it is suggested that no outdoor dining facilities are provided at the mid station or Crawford Knob station, and that outdoor dining is prohibited at all open-air facilities at these locations.

12.1.3 Bats

A detailed survey of the Waiho Valley using Automatic Bat Monitors (ABMs) is recommended to determine if the local long-tailed bat population is utilising the valley for foraging and roosting. If bats are detected from this survey a detailed Bat Management Plan will be required to address the potential effects on long-tailed bats is recommend.

12.1.4 Lizards

Surveys

Due to the presence of possible lizard habitat within the site, a targeted lizard survey should be undertaken to inform whether further lizard management and a Wildlife Act Authority are required for the AC construction. The survey should be undertaken during the lizard active season (November to March inclusive) in suitable weather conditions. The lizard survey should be undertaken by a suitably qualified herpetologist and follow DOC-accepted methods. The surveys may include targeted trapping in representative lizard habitats and systematic searching (such as rock lifting in boulderfield) to determine the abundance and distribution of lizards present within the site. Due to the unresolved taxonomy and uncertainty around lizard distributions in the area, all lizards captured during the survey period are highly recommended to be tail tipped for the purposes of genetic analysis.

Avoidance of Lizard Habitat

In the first instance, where any identified habitat can remain in situ, major effects such as habitat loss, death and disturbance to indigenous lizards may be minimised. Surveys would determine the extent and quality of lizard habitats within the site.

Lizard Management Plan

If lizards are detected within the development area of the AC, a Lizard Management Plan (LMP) and Wildlife Act Authority will be required by DOC to address any effects to lizards.

If lizard habitats cannot be avoided, the LMP will detail potential management and mitigation options. These could involve avoidance of habitats (as above), mitigation measures such as supervised vegetation clearance, and salvage. However, DOC's fourth principle in 'key principles for lizard salvage and transfer in New Zealand' states that Threatened lizard species require more careful consideration than less-threatened species (DOC, 2019). Due to the potential for at least one Threatened – Nationally Critical species being present within the AA area it is likely that lizard salvage will not be an appropriate management method, and further consideration may be required at the site. In this case, if avoidance couldn't be achieved, then other options for the AC should be sought, or if deemed suitable, offsetting and compensation should be considered. Site development with the implementation of a LMP could result in **minor** adverse effects on lizards, if present.

If lizard habitats cannot be avoided, the LMP and Wildlife Act Authority will address the key principles of lizard transfer and salvage and ways to reduce impacts of the development on lizards, as outlined by DOC (2019 & 2023).

If lizard habitats can be avoided or no lizards are detected during surveys, no LMP or Wildlife Act Authority will be required, but an Incidental Discovery Protocol (IDP) should be prepared and followed in case lizards are encountered during works.

12.1.5 Invertebrates

Avoidance of Key Invertebrate Habitat

Habitat removal should be carefully planned to avoid rare or particularly special invertebrate habitats. Planning should include a field-based invertebrate survey to determine which habitats are most important. All habitat on-site is potentially important invertebrate habitat, so effects cannot be avoided altogether.

Minimisation of Habitat Clearance

Clearance of plants, topsoil and rocks should be minimised so that only that which is necessary may be cleared.

Invertebrate Management Plan

Invertebrate management options will become better-understood as the project is planned further, and after further invertebrate surveying is undertaken. An invertebrate management plan can then be devised, including management options for any protected or notable species confirmed on-site, and incidental discovery protocols. Lighting management will also be discussed in the invertebrate management plan if necessary. The plan may contain salvage and translocation protocols if salvage is deemed an appropriate option.

12.1.6 Freshwater fish

To avoid fish injury or death during road construction, working within the waterways should be avoided where possible. In cases where the waterway must be worked in, the effect of the construction works can be reduced by working outside of the fish spawning seasons (for most species, this is between August and February), and through careful placement of the construction footprint.

In some of the smaller waterways, it is possible to further reduce the impacts by sectioning off water waterway with fish barriers, and de-fishing the affected section. In this case a Fish Management Plan should be prepared and implemented before any works take place. The plan should detail methods for capturing and/or deterring indigenous fish species from the area to minimise this effect. It should detail where the fish are to be released, how fish will be prevented from re-entering the area, protocols if pest fish are found, fish welfare, and adaptive management options.

12.1.7 Pest animals

Avoid Dropping Food On-Site

All food taken on-site should either be consumed or packed out, both during the construction phase and for the life of the project.

Minimise Human Tracking On-Site

Tracks through the site should be minimised, and used for as short a time as possible before restoring them. Fortunately, the cableway system already limits the necessity for tracks, but introduced mammals may still follow the cable route if the ground beneath is easier to traverse than the surrounding landscape. The ground beneath the cable route should therefore be left or restored as much as is practicable after construction is complete.

12.1.8 Sediment mitigation controls

Sediment control could be set up in appropriate areas to minimize suspended sediment. Earthworks within or near streams should be avoided where possible. Where earthworks are required near waterways, a management plan should be in place to reduce the risk of fine sediment entering the waterways.

Areas where heavy machinery must repeatedly cross a waterway, a temporary or permeant crossing should be installed to reduce repeated disturbance of the stream bed. These crossing should not, alter, dam, or divert the natural alignment or gradient of the waterway and the river crossings must provide for upstream and downstream fish and invertebrate passage. The installed river crossings must not cause or induce erosion of the stream bed or banks, or instability of the banks of the water body.

12.2 Remediation, offset, and compensation measures

12.2.1 Vegetation and flora

All disturbed ground resulting from construction works will need to be revegetated as quickly as possible, using indigenous species appropriate to the site. This may require propagation of eco-sourced plants in advance, particularly for areas of the AC above the bush line, and should include individuals of any Threatened and At Risk species affected by the development.

Offsetting for the loss of the alluvial seral broadleaved forest associated with the carpark and base building area would be straightforward to achieve, by planting a similar-sized area of seral vegetation on cleared land elsewhere in the ecological district (of which there is plenty available) and granting it ongoing legal protection. Offsets are commonly deployed in discretionary resource consent applications as a component of the effects management hierarchy. Development of a biodiversity offset accounting model (BOAM) is an integral part of the offset process and can help ensure a like-for-like exchange is achieved that results in no net loss of biodiversity.

However, offsetting of the remaining vegetation loss is unlikely to be possible, due to the lack of opportunities to restore similar habitat types on steep slopes or subalpine zones. Compensation measures will be required for this, and appropriate measures are available in the ecological district. For example, one option would be to undertake restoration of a regionally under-represented lowland forest ecosystem (such as alluvial kahikatea forest) in an equivalent or larger area of cleared land. This could be undertaken in conjunction with the offset of seral broadleaved forest, providing a single area of protected plantings in the lowlands of the ecological district. Other opportunities could include control of pest mammalian herbivores in the alpine zone, or financial contributions to threatened plant conservation and management in the Westland region.

12.2.2 Accidental introduction of pest plants and facilitation of their establishment

Ongoing monitoring and control of exotic plants will be required thoughout the development zone of the AC and the surrounding areas, to ensure that no new species become established and that existing species do not spread or increase in abundance. This will require a thorough plan and vigilance in implementing the plan. In particular, strict protocols will need to be in place to manage this threat at Crawford Knob, where introduction of exotic species is eespecially likely to occur periodically due to the ongoing presence of visitors within an environment that is currently intact and receives very few visitors. Restricting visitors to facilities, as proposed by SEL, is an important component of this . Possible weed introductions arising from concessionaire activity beyond the AC facilities will need to be managed through consent conditions.

12.2.3 Lizards

Depending on the outcome of the lizard surveys, offsetting and compensation may be required. These will be described in the LMP if necessary.

12.2.4 Invertebrates

The invertebrate management plan may include remediation options such as habitat restoration through predator control and/or creation of refuges.

If effects on invertebrates cannot be fully addressed using the measures discussed above, offsetting options are likely to be limited due to the lack of nearby opportunities to restore similar habitat types for invertebrates. The invertebrate management plan may discuss compensation measures such as research and public outreach.

12.2.5 Pest animal management

Increased pest animal management should be an effective form of remediation, as introduced pests are a tremendous threat to indigenous biota, and the threat may increase with the development of the project.

The nature of predator management depends on current controls in place and species present, but is likely to involve pest monitoring and control measures, either increasing current effort or adding in new management options.

12.3 Assessment of potential effects with avoidance and other effects management measures

The potential level of ecological effects has been assessed on indigenous vegetation, avifauna, bats, invertebrates, lizards and freshwater habitat with avoidance and effects management measures, outlined in Table 9. This gives an indication of how effects could be significantly reduced with mitigation measures in place. Note that this is a preliminary assessment; detailed surveys of flora and fauna are required once locations of works are finalised.

Table 9 – Potential significance of ecological effects resulting from the Franz Josef AC if effects management hierarchy measures are implemented.

Effect	Management Measures	Overall Level of Adverse Effect
Loss of indigenous vegetation	Replanting within disturbed ground where possible; offset and compensation plantings	Less than minor
Loss of Threatened and At Risk plant species	Avoidance of any locally abundant populations in the subalpine/alpine zones; replanting in nearby habitat of any individual plants lost.	Less than minor
Fragmentation of indigenous vegetation	Replanting within disturbed ground where possible	Less than minor
Accidental introduction of pest plants and facilitation of their establishment	Development and implementation of a monitoring and control plan that ensures no new weed incursions in the AA	Minor
Loss of avifauna, bat, lizard, and invertebrate habitat	Develop and implement fauna management plans, including increased pest animal management.	Less than minor

Effect	Management Measures	Overall Level of Adverse Effect
Fragmentation of invertebrate habitat	Replanting within disturbed ground where possible	Less than minor
Disturbance, injury, or death of fauna during vegetation clearance and construction	Avoid works during avifauna breeding season; develop and implement fauna management plans; barriers around areas of open ground (pits and trenches) where rowi/Ōkarito brown kiwi and western weka may forage or roost to prevent entrapment, injury, or death.	Less than minor
Beeding failure or behavioural effects on lizards and invertebrates	Develop and implement fauna management plans	Less than minor
Accidental facilitation of introduced pest animal movement and incursion into habitat	Avoid human food outside of managed areas; minimise human tracking within AA; increased pest animal management	Less than minor
Sedimentation and contamination of creeks during earthworks and construction	Avoidance of waterways where possible; sediment management plan during construction	Less than minor
Ongoing disturbance to fauna	Strict management of human interaction with fauna, including no outdoor dining; decals or UV-reflecting film applied to all reflective windows to reduce strike risk.	Minor
Trampling of vegetation by visitors	Restrict visitor access to defined facilities areas.	Less than minor

13.0 Conclusions

The proposed Franz Josef AA has very high ecological values, reflecting flora, fauna, and landscape factors. It is an integral part of a protected intact altitudinal landform and vegetation sequence containing diverse ecosystems from lowland forest to alpine fellfield. In conjunction with the adjoining landscape, it provides habitat for a wide and diverse array of indigenous flora and fauna. The site visit and desktop analyses indicate that several Threatened or At Risk species listed in the New Zealand Threat Classification System are present within the AA, incuding at least three plant species (and possibly up to nine additional species), at least eight avifauna species, at least one freshwater fish species, and at least one lizard species. Additional surveys are required to better understand their presence, abundance and distributrion, especially for lizards and invertebrates for which there is limited existing information.

Portions of the lowland areas of the AA are also part of the Franz Josef Glacier chronosequence, which is of international scientific importance as one of the best examples globally of soil and vegetation development following glaciation.

The proposed AA meets all of the criteria for significance under both the NPS-IB and Westland District Plan, although it is not mapped as an SNA in the TTPP. This reflects the high values of the AA in relation to representativeness of habitats, presence of threatened flora and fauna species, connectivity and buffering functions, intactness of ecosystems, protected status of the land, and scientific and cultural factors.

The effects of the proposed AC on ecological values primarily relate to the loss of vegetation and habitat, the increased likelihood of exotic plant and animal invasion within intact habitats, the risk of bird strike from window reflection with the aerial cabins and possibly the cableway itself, and disruption of kea behaviour by visitors at Crawford Knob in particular. It is likely that the development will require clearance of more than 2,000 m^2 of indigenous vegetation, and will require consent for vegetation clearance.

The ecological effects of the proposal related to construction activities and vegetation and habitat loss can be appropriately managed through a combination of avoidance measures, fauna management plans, and offsetting and compensation plantings in lowland environments of the ecological district. Details of effects management would need to be developed further as the project progresses and after further surveying has been undertaken. However, with these measures in place it is considered likely that residual ecological effects will be reduced to levels that are no more than minor.

The ecological effects relating to the operation of the AC will require careful ongoing management. These relate primarily to the indirect effects of increased visitors within the subalpine environment of the mid station and Crawford Knob, remote areas that currently see only a handful of visitors every year. This change in accessibility presents a risk of pest plant and animal incursions, that could then act as a source for spread into the surrounding environment. Effects of humans on kea behaviour also pose an issue at these locations, similar to that experienced in mountain townships and skifields of the South Island. It will be critical that stringent management plans and procedures are in place to manage these visitor-related effects, including restricting visitors to facilities, but with such measures in place it is considered that residual effects will be reduced to levels that are minor.

The ongoing operation of the AC also carries the risk of bird strike, predominantly with reflective surfaces which can lead to injury or death of flying avifauna.

Subject to the findings of the additional ecological surveys, it is considered that the ecological effects of the proposal can be appropriately managed through a combination of avoidance measures, fauna management plans, and offsetting and compensation plantings in lowland environments of the ecological district. Details of effects management and AC design would need to be developed at the time of a resource consent application, and following completion of the additional ecological surveys. The draft provisions proposed by SEL for the AA are considered to provide adequate direction and scope for the ecological effects outlined in this report to be appropriately assessed and managed, through a discretionary consenting process. Wildlands therefore consider that, subject to these further surveys and AC design refinements, it is feasible from an ecological perspective to apply the proposed AA and implement a future AC with effects likely being minor or less.

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Appendix 1

Selected photographs of vegetation and habitats.

Plate 1 – View from top of the roche moutonnée tower site, looking down to the seral low broadleaved forest. Waiho River bed is on right, and (podocarp-southern rātā)/kāmahi forest in top right corner.

Plate 2 — Interior of the seral low broadleaved species forest.

Plate 3 – Bare rock and colonising plants on the top of the roche moutonnée where a tower is proposed.

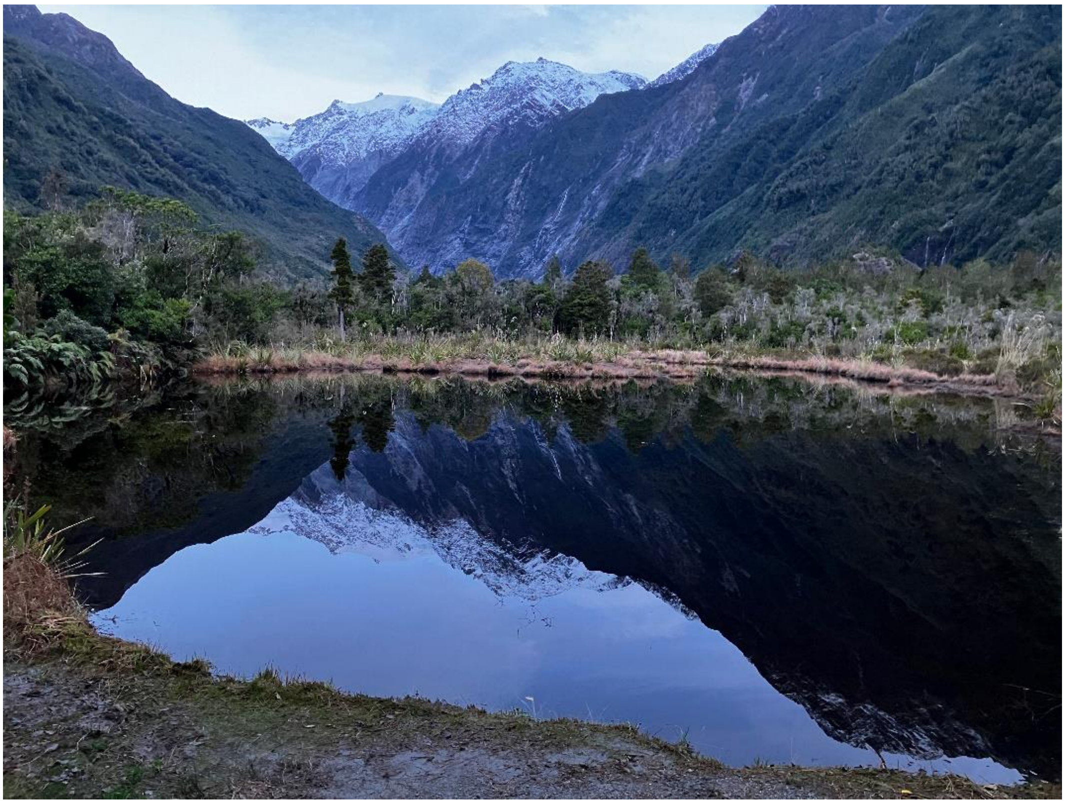

Plate 4 — The small kettle lake (Peter's Pool) near the carpark.

Plate 5 – Seral vegetation on scoured bedrock.

Plate 6 — A rimu tree on scoured bedrock.

Plate 7 – Seral vegetation on scoured bedrock, with a view beyond to the Waiho River bed, roches moutonnées and carpark area.

Plate 8 — Interior of upland southern rātā/kāmahi forest.

Plate 9 – An exposed spur near the top of the southern rātā/kāmahi forest, near the proposed site of a tower.

Plate 10 — *Dracophyllum-Olearia* forest and scrub, in the headwaters of Rope Creek.

Plate 11 – *Dracophyllum-Olearia* forest and scrub, in the headwaters of Rope Creek.

Plate 12 – A diverse patch of vegetation in the *Dracophyllum-Chionochloa* scrub/ grassland mosaic, containing species of *Olearia*, *Aciphylla*, *Celmisia*, *Phormium*, and *Chionochloa.*

Plate 13 — Steep tussock slopes on the northern faces near Coulter Ridge.

Plate 14 – Coulter Ridge.

Plate 15 — Slopes leading to Hende Ridge.

Plate 16 – Basins and slopes beteen Hende Ridge and Crawford Knob (red dot).

Plate 17 — Hende Ridge in foreground, looking across basins and rocky slopes to Crawford Knob (red dot).

Appendix 2

Vascular plant species observed during the site visit.

Indigenous Species

Species	Common Name	
Acaena anserinifolia	Bidibid, piripiri	Herbs - Dicotyledons
Aciphylla crenulata	Spaniard	Herbs - Dicotyledons
Aciphylla horrida	Spaniard	Herbs - Dicotyledons
Anaphalioides bellidioides	Hell's bells	Herbs - Dicotyledonous composites
Anthoxanthum redolens	Holy grass, kāretu	Grasses
Aristotelia serrata	Makomako, wineberry	Trees & Shrubs
Asplenium bulbiferum	Hen and chicken fern, pikopiko	Ferns
Asplenium flaccidum	Hanging spleenwort	Ferns
Astelia fragrans	Bush flax, bush lily, kakaha	Herbs - Monocots
Astelia nervosa	Mountain astelia	Herbs - Monocots
Austroderia richardii	Toetoe	Grasses
Blechnum colensoi	Colenso's hard fern, peretao, petako	Ferns
Blechnum deltoides	Korokio, mountain hard fern	Ferns
Blechnum discolor	Piupiu, crown fern	Ferns
Blechnum fluviatile	Kiwakiwa, creek fern	Ferns
Blechnum lanceolatum	Lance fern, nini	Ferns
Blechnum novae-zelandiae	Kiokio, horokio, palm leaf fern	Ferns
Blechnum penna-marina	Little hard fern, alpine hard fern	Ferns
Carex comans		Sedges
Carex corynoidea	Bastard grass, fish hooks	Sedges
Carex gaudichaudiana		Sedges
Carex silvestris	Forest bastard grass, hook sedge	Sedges
Carex sinclairii	Sinclair's sedge	Sedges
Carex uncinata	Bastard grass, hook sedge, kamu	Sedges
Carmichaelia odorata	Scented broom, leafy broom	Trees & Shrubs
Carpodetus serratus	Marbleleaf, putaputawēta, piripiriwhata	Trees & Shrubs
Cheilanthes distans	Rockfern	Ferns
Chiloglottis cornuta	Bird orchid, ant orchid	Orchids
Chionochloa conspicua	Hunangamoho, broad-leaved bush tussock	Grasses
Chionochloa pallens	Mid-ribbed snow tussock	Grasses
Chionochloa rigida	Narrow-leaved snow tussock	Grasses
Clematis paniculata	White clematis, puawananga	Lianes
Coprosma ciliata		Trees & Shrubs
Coprosma depressa		Trees & Shrubs
Coprosma foetidissima	Hūpiro, stinkwood	Trees & Shrubs
Coprosma lucida	Karamū, shining karamū	Trees & Shrubs
Coprosma propinqua	Mingimingi	Trees & Shrubs
Coprosma pseudocuneata		Trees & Shrubs

Species	Common Name	
Coprosma rhamnoides		Trees & Shrubs
Coprosma rigida		Trees & Shrubs
Coprosma rotundifolia		Trees & Shrubs
Coprosma rugosa		Trees & Shrubs
Coriaria arborea	Tutu, tree tutu	Trees & Shrubs
Corybas acuminatus	Spider orchid	Orchids
Corybas oblongus	Spider orchid	Orchids
Corybas trilobus	Spider orchid	Orchids
Cyathea smithii	Kātote, Smith's tree fern, soft tree fern	Ferns
Dacrydium cupressinum	Rimu	Trees & Shrubs
Dendrobium cunninghamii	Pekapeka, Christmas orchid	Orchids
Dicksonia squarrosa	Wheki, rough tree fern, harsh tree fern	Ferns
Dracophyllum longifolium	Inanga, inaka	Trees & Shrubs
Dracophyllum rosmarinifolium		Trees & Shrubs
Dracophyllum traversii	Mountain neinei, pineapple tree	Trees & Shrubs
Earina autumnalis	Easter orchid, raupeka	Orchids
Earina mucronata	Bamboo orchid, peka-a-waka	Orchids
Epilobium glabellum	Willowherb	Herbs - Dicotyledons
Epilobium pedunculare	Willowherb	Herbs - Dicotyledons
Euchiton audax	Creeping cudweed	Herbs - Dicotyledonous composites
Fuchsia excorticata	Kōtukutuku, tree fuchsia	Trees & Shrubs
Galium propinquum	Māwe	Herbs – Dicotyledons
Gaultheria macrostigma	Prostrate snowberry	Trees & Shrubs
Gaultheria rupestris		Trees & Shrubs
Gentianella bellidifolia	Gentian	Herbs – Dicotyledons
Gentianella spenceri	Spencer's gentian	Herbs - Dicotyledons
Gleichenia dicarpa	Tange fern	Ferns
Gonocarpus montanus		Herbs – Dicotyledons
Griselinia littoralis	Kāpuka, broadleaf	Trees & Shrubs
Gunnera dentata		Herbs - Dicotyledons
Hedycarya arborea	Porokaiwhiri, pigeonwood	Trees & Shrubs
Hierochloe cuprea		Grasses
Histiopteris incisa	Mātātā, water fern	Ferns
Hoheria glabrata	Mountain lacebark	Trees & Shrubs
Hydrocotyle novae-zeelandiae		Herbs - Dicotyledons
Hymenophyllum demissum	Drooping filmy fern, Irirangi, piripiri	Ferns
Hymenophyllum dilatatum	Filmy fern, matua mauku	Ferns
Hymenophyllum flabellatum	Filmy fern	Ferns
Hymenophyllum multifidum	Much-divided filmy fern	Ferns
Hymenophyllum nephrophyllum	Kidney fern, konehu, kopakopa	Ferns
Hymenophyllum rarum	Filmy fern	Ferns
Hymenophyllum rufescens	Filmy fern	Ferns
Hymenophyllum sanguinolentum	Filmy fern, piripiri	Ferns
Hypolepis millefolium	Thousand leaved fern	Ferns
Isolepis cernua	Slender clubrush	Sedges
Isolepis prolifera		Sedges

Species	Common Name	
Juncus edgariae	Wiwi, Edgar's rush	Rushes & Allied Plants
Juncus novae-zelandiae		Rushes & Allied Plants
Juncus planifolius		Rushes & Allied Plants
Leptinella squalida		Herbs - Dicotyledonous composites
Leptolepia novae-zelandiae	Lace fern	Ferns
Leptopteris superba	Heruheru, crepe fern, Prince of Wales feathers	Ferns
Lindsaea trichomanoides		Ferns
Lobelia angulata	Pratia	Herbs - Dicotyledons
Luzula banksiana	Woodrush	Rushes & Allied Plants
Luzuriaga parviflora	Nohi, lantern berry	Herbs - Monocots
Lycopodium scariosum	Creeping clubmoss	Lycophytes
Mazus radicans		Herbs - Dicotyledons
Melicytus lanceolatus	Narrow-leaved māhoe	Trees & Shrubs
Melicytus ramiflorus	Māhoe	Trees & Shrubs
Metrosideros diffusa	White rātā	Lianes
Metrosideros fulgens	Climbing rātā	Lianes
Metrosideros umbellata	Southern rātā	Trees & Shrubs
Microlaena avenacea	Bush rice grass, oat grass	Grasses
Microsorum pustulatum	Kōwaowao, hound's tongue	Ferns
Muehlenbeckia complexa	Scrub pōhuehue, wire vine	Lianes
Myrsine australis	Māpou	Trees & Shrubs
Myrsine divaricata	Weeping māpou	Trees & Shrubs
Nertera depressa	Nertera, bead plant	Herbs - Dicotyledons
Nertera villosa	Hairy forest nertera	Herbs - Dicotyledons
Notogrammitis billardierei	Common strap fern	Ferns
Notogrammitis heterophylla	Taupeka, comb fern	Ferns
Olearia arborescens	Common tree daisy, glossy tree daisy	Trees & Shrubs
Olearia avicenniifolia	Mountain akeake	Trees & Shrubs
Olearia ilicifolia	Mountain holly	Trees & Shrubs
Olearia lacunosa	Lancewood tree daisy	Trees & Shrubs
Pakau pennigera	Gully fern, feather fern, piupiu	Ferns
Pectinopitys ferruginea	Miro	Trees & Shrubs
Phlegmariurus varius	Clubmoss	Lycophytes
Phormium cookianum	Wharariki, mountain flax	Herbs - Monocots
Phormium tenax	Harakeke, lowland flax	Herbs - Monocots
Pittosporum tenuifolium	Kōphūhū	Trees & Shrubs
Poa cockayneana	Avalanche grass	Grasses
Poa novae-zelandiae	Drooping poa	Grasses
Podocarpus laetus	Hall’s tōtara, thin-barked tōtara	Trees & Shrubs
Polystichum vestitum	Puniu, prickly shield fern	Ferns
Prumnopitys taxifolia	Mataī	Trees & Shrubs
Pseudodiphasium volubile	Climbing clubmoss, waewaekoukou	Lycophytes
Pseudognaphalium luteoalbum		Herbs - Dicotyledonous composites
Pseudopanax colensoi	Mountain fivefinger, three finger	Trees & Shrubs
Pseudopanax crassifolius	Horoeka, lancewood	Trees & Shrubs
Pseudowintera colorata	Horopito, peppertree	Trees & Shrubs

Species	Common Name	
Pterophylla racemosa	Kāmahi	Trees & Shrubs
Pterostylis australis	Southern greenhood	Orchids
Pterostylis banksii	Tutukiwi, greenhood	Orchids
Pterostylis graminea	Grass-leaved greenhood	Orchids
Ranunculus glabrifolius	Waoriki	Herbs - Dicotyledons
Ranunculus reflexus	Hairy buttercup, maru, maruru	Herbs - Dicotyledons
Raukaua simplex	Haumakoroa	Trees & Shrubs
Ripogonum scandens	Supplejack, kareao, pirita	Lianes
Rubus cissoides	Bush lawyer	Lianbes
Rubus schmidelioides	Tātarāmoa, bush lawyer, white-leaved lawyer	Trees & Shrubs
Rumohra adiantiformis	Leathery shield fern	Ferns
Schefflera digitata	Patē, seven-finger	Trees & Shrubs
Senecio wairauensis	Mountain fireweed	Herbs - Dicotyledonous composites
Thelymitra longifolia	White sun orchid, mä•ikuku	Orchids
Tmesipteris elongata	Fork fern	Ferns
Trichomanes venosum	Veined bristle fern, veined filmy fern	Ferns
Veronica salicifolia	Koromiko	Trees & Shrubs
Viola cunninghamii	Mountain violet, white violet	Herbs - Dicotyledons

Naturalised and Exotic Species

Species	Common Name	
Anthoxanthum odoratum	Sweet vernal	Grasses
Bellis perennis	English daisy	Herbs - Dicotyledonous composites
Cerastium fontanum	Mouse ear chickweed	Herbs - Dicotyledons
Cirsium vulgare	Scotch thistle	Herbs - Dicotyledonous composites
Glyceria declinata	Blue sweet grass	Grasses
Holcus lanatus	Yorkshire fog	Grasses
Juncus tenuis	Track rush	Rushes & Allied Plants
Lolium arundinaceum	Tall fescue	Grasses
Lotus pedunculatus	Lotus	Herbs - Dicotyledons
Ranunculus repens	Buttercup	Herbs - Dicotyledons
Sonchus arvensis	Perennial sow thistle	Herbs - Dicotyledonous composites

Appendix 3

Ecological significance assessments of the AA

A) Ecological significance assessment against Westland District Plan criteria (Section 4.9D)

Criteria	Evaluation
(i) Intactness. The area is unmodified by human activity, comprises a predominantly intact indigenous system and is not affected in a major way by weed or pest species; AND the area of indigenous vegetation has a predominant cover of 5 hectares of more.	**Criterion met.** The AA contains a very large area of intact indigenous ecosystems, with very minor weed incursions. Pest animal species have affected ecosystems to a degree that is typical of the ecological district and region.
(ii) Representativeness. The area is one of the best examples of an association of species which is typical of its ecological district;	**Criterion met.** The AA contains one of the best natural elevational sequences of floral and fauna species in the ecological district.
(iii) Distinctiveness. The area has indigenous species or an association of indigenous species which is unusual or rare in the ecological district, or endemic or reaches a distribution limit in the ecological district. The area may be distinctive because of the influences of factors such as altitude, water table, soil type or geothermal activity.	**Criterion met.** The AA is distinctive due to its combination of altitudinal and glacial sequences. Such sequences are unique to the Franz Josef and Fox Glacier Valleys.
(iv) Protected Status. The area has been set aside by New Zealand Statute or Covenant for protection and preservation or is a recognised wilderness area.	**Criterion met.** The AA is part of Westland Tai Poutini National Park.
(v) Connectivity. The area is connected to one or more other significant areas in a way (including through ecological processes) which makes a major contribution to the overall value or natural functioning of those areas.	**Criterion met.** The AA is an integral part of the surrounding Westland Tai Poutini National Park, and is critical to the functioning of the ecosystems within the upper Waiho Valley.
(vi) Threat. The area supports an indigenous species or community of species which is threatened within the ecological district or threatened nationally.	**Criterion met.** The AA provides habitat for many Threatened and At Risk flora and fauna species. Targeted surveys of fauna would likely reveal even more species.
(viii) Scientific or other Cultural Value. The area is a type, locality or other scientific reference area, is listed as a geopreservation site, or has a distinctive amenity value (e.g. it contributes to a distinctive and outstanding landscape of the district, has other significant cultural value or is of international importance).	**Criterion met.** The AA has a distinctive amenity value, being an integral part of the visitor attraction of the Franz Josef Glacier Valley. The AA is also of international importance for scientific research into soil and vegetation chronosequences.
Is the site significant?	**Yes – the entire AA**
Criteria met for significance	**All criteria**

B) Ecological significance assessment against National Policy Statement for Indigenous Biodiversity criteria

Criteria	Evaluation
Representativeness is the extent to which the indigenous vegetation or habitat of indigenous fauna in an area is typical or characteristic of the indigenous biodiversity of the relevant ecological district.	
(a) Indigenous vegetation that has ecological integrity that is typical of the character of the ecological district:	**Criterion met.** The AA has very high ecological integrity.
(b) Habitat that supports a typical suite of indigenous fauna that is characteristic of the habitat type in the ecological district and retains at least a moderate range of species expected for that habitat type in the ecological district.	**Criterion met**. The AA supports a diverse suite of fauna typical of the ecological district, and has a high diversity of species.
Diversity and pattern is the extent to which the expected range of diversity and pattern of biological and physical components within the relevant ecological district is present in an area.	
(a) at least a moderate diversity of indigenous species, vegetation, habitats of indigenous fauna or communities in the context of the ecological district.	**Criterion met.** The AA has a very high diversity of all of these factors.
(b) presence of indigenous ecotones, complete or partial gradients or sequences.	**Criterion met.** The AA includes a very wide range of gradients and sequences, including elevational, topographical, landform, glacial, and terrestrial/wetland.
Rarity and distinctiveness is the presence of rare or distinctive indigenous taxa, habitats of indigenous fauna, indigenous vegetation or ecosystems.	
(a) provides habitat for an indigenous species that is listed as Threatened or At Risk (declining) in the New Zealand Threat Classification System lists.	**Criterion met**. The AA provides habitat for many Threatened and At Risk flora and fauna species. Targeted surveys of fauna would likely reveal even more species.
(b) an indigenous vegetation type or an indigenous species that is uncommon within the region or ecological district:	Criterion unlikely to be met. Vegetation types and species within the AA are generally relatively widespread in the region and ecological district, although targeted surveys are required to confirm this for fauna.
(c) an indigenous species or plant community at or near its natural distributional limit	Criterion unlikely to be met, although targeted fauna surveys are required to confirm this. met.
(d) indigenous vegetation that has been reduced to less than 20% of its pre-human extent in the ecological district, region, or land environment	Criterion not met.
(e) indigenous vegetation or habitat of indigenous fauna occurring on naturally uncommon ecosystems	**Criterion met.** The AA contains indigenous vegetation on young moraines less than 250 years old, which are naturally uncommon.
(f) the type locality of an indigenous species	Criterion not met.
(g) the presence of a distinctive assemblage or community of indigenous species	Criterion not met.
(h) the presence of a special ecological or scientific feature.	**Criterion met.** The AA contains parts of an internationally important glacial chronosequence.
Ecological context is the extent to which the size, shape, and configuration of an area within the wider surrounding landscape contributes to its ability to maintain indigenous biodiversity or affects the ability of the surrounding landscape to maintain its indigenous biodiversity.	

Criteria	Evaluation
(a) at least moderate size and a compact shape, in the context of the relevant ecological district	**Criterion met.** The AA is large. While elongated, it is contiguous with similar intact ecosystems spanning a wide area
(b) well-buffered relative to remaining habitats in the relevant ecological district	**Criterion met.** The AA is surrounded by the natural landscapes and ecosystems of Westland Tai Poutini National Park.
(c) provides an important full or partial buffer to, or link between, one or more important habitats of indigenous fauna or significant natural areas	**Criterion met.** The AA is an integral part of Westland Tai Poutini National Park and its intact indigenous ecosystems.
(d) important for the natural functioning of an ecosystem relative to remaining habitats in the ecological district	**Criterion met.** The AA is integral to the functioning of ecosystems in the Waiho Valley, from lowland to alpine habitats.
Is the site significant?	**Yes - the entire AA**
Criteria met for significance	**All four criteria are met, and most sub-criteria**

Appendix 4

Avoidance of adverse effects on SNA listed in Clause 3.10(2) of the NPS-IB.

If the proposed AA was at some future time to become part of a scheduled SNA under the current version of the NPS-IB, then when considering management of the effects of the AC on the SNA each of the adverse effects identified in Clause 3.10(2) of the NPS-IB would need to be avoided. These adverse effects are:

> *(a) loss of ecosystem representation and extent:*
>
> *(b) disruption to sequences, mosaics, or ecosystem function:*
>
> *(c) fragmentation of SNAs or the loss of buffers or connections within an SNA:*
>
> *(d) a reduction in the function of the SNA as a buffer or connection to other important habitats or ecosystems:*
>
> *(e) a reduction in the population size or occupancy of Threatened or At Risk (declining) species that use an SNA for any part of their life cycle.*

Any future SNA containing the AA would be likely to incorporate not only the adjoining Westland National Park, but also a vast area of connected DOC-administered land spanning multiple catchments in the western Southern Alps with similar landforms and ecosystems. Such an SNA is assumed as the reference point in the following overview of how effects on SNA identified in Clause 3.10(2) could be avoided in development of the AC.

3.10.2(a): Loss of ecosystem representation and extent.

All ecosystems potentially affected by the AC are highly representative of the typical indigenous vegetation or habitat of indigenous fauna in the Waiho Valley, and are typical and characteristic of the indigenous biodiversity of the Glacier Ecological District and the wider western Southern Alps region. The proposed rezoning and AC would not result in a loss of this ecosystem representation within the AA or the SNA, as the impacted areas are very restricted and will not affect remaining ecosystem representation.

While the AC would result in a small loss of extent alone (and not representation) of affected ecosystems on the eastern side of the Waiho Valley, on account of towers and infrastructure at the mid station and Crawford Knob, this loss of extent represents an extremely small proportion of the area of these ecosystems in the AA and wider SNA. This would affect southern rātā=kāmahi forest, subalpine scrub, subalpine grassland and alpine fellfield, ecosystems which cannot be offset in a like-for-like manner.

3.10.2(b): Disruption to sequences, mosaics, or ecosystem function

The proposed AC would result in removal of several small, unconnected areas of indigenous vegetation and habitat. This removal would not disrupt the altitudinal and glacial sequences of the SNA, or disrupt ecosystem function. This is because the scale of impact is extremely small in relation to the scale of the sequences, mosaics and ecosystem function within the AA and surrounding SNA. The natural disturbance regime within the SNA includes regular (i.e. annual) events (such as avalanches or landslides) of a scale greater than anything anticipated from the AC, and periodic events of a vastly greater scale.

3.10.2(c): Fragmentation of SNAs or the loss of buffers or connections within an SNA

The loss of several small areas of vegetation and habitat resulting from the AC would be of little consequence with respect to fragmentation or loss of buffers or connections within the SNA. The affected areas are extremely small in the context of these processes within the SNA.

3.10.2(d): A reduction in the function of the SNA as a buffer or connection to other important habitats or ecosystems

The proposed AC would not result in a reduction in the function of the SNA as a buffer or connection to other important habitats or ecosystems. The portion of the SNA containing the proposed AC does not buffer or connect to important habitats or ecosystems outside of the SNA.

3.10.2(e): A reduction in the population size or occupancy of Threatened or At Risk (declining) species that use an SNA for any part of their life cycle

This will be avoided by implementation of measures contained in flora and flora management plans, to be developed at the time of a consent application, and by appropriate siting of works as informed by future detailed surveys. Mitigation measures contained in these plans that SEL would be required to undertake (e.g. pest animal control and plantings) are likely to increase the population size and occupancy of many of these species.

Removal of a few trees of southern rātā is likely to be required if a tower is located in the southern rātā-kāmahi forest habitat. This is of no consequence to the population size or occupancy of southern rātā in the SNA, and this species will regenerate vigorously on disturbed ground following removal.

Potential ongoing effects of increased human visitation at the mid station and Crawford Knob station, relating to visitors trampling or changing vegetation and feeding of kea, can be avoided by restricting public access outside of facilities and restricting dining to indoor areas at these locations.

Call Free 0508 WILDNZ
Ph +64 7 343 9017
Fax +64 7 349018
ecology@wildlands.co.nz

99 Sala Street
PO Box 7137, Te Ngae
Rotorua 3042, New Zealand

Regional Offices located in Auckland; Christchurch; Dunedin; Hamilton; Invercargill; Queenstown; Tauranga; Wānaka; Wellington; Whakatāne; Whangārei.

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